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Better Crops with PLANT FOOD

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R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

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EVERY EAR COUNTS THIS YEAR

Better Crops with PLANT FOOD

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Recollections . . . . .

About Pa

Jeff McDermid

IN SPITE of all the famous books and plays that have been written about Fathers and the relatives who lived with them in those far-off simple times, it strikes me that almost any fellow with a fair memory and a liking for reminiscences could whittle away with zeal on a picture of his own Dad—possibly long since departed this life. By and large and taking into consideration their influence on the period in which they lived, most of those good old Dads of ours registered almost nothing tangible or lasting in a public way. Yet it has always sort of impressed me that it is the multiple effect of all these humble and obscure Dads working along quietly and unobtrusively and without renown that really makes this one of the best of all nations in the world.

You see, they leave behind them a strong private tradition, if not a public acclaim, which, like all the nameless creeks that bring more waters to a great river, serves to deepen and widen the flow of national integrity. For the sum total of a country's character rests upon the communities and families that sustain it.

I suppose also that a majority of us had country-born-and-bred fellows for our progenitors. Not that this makes a whit of real difference in their uphill battles or their degree of responsibility from the Dads who never left the pavements—but it sort of unites a lot of us in a common "pasture" as it were from where we can look over the fences in the same general direction and note the same scenery while discussing our honored Sires.

I do not draw upon my own case be-

cause it is remarkable or because it has any brilliant periods or startling memoirs to submit. In fact, I have no line of writing by my Father to show anybody or any masterpiece of his making to exhibit with pride.

He was just "Pa," very deficient in book learning and scholastic knowledge, somewhat awkward in his etiquette at times, and constantly short of the wherewithal to do the things that he saw some other Dads perform for their offspring.

MOST OF THE big successful books I have read about Fathers are set in a realm of riches compared to my own; and those Fathers were usually more or less successful professional or business men with a background of varied experiences and important outside activities. I haven't yet found a book that spoke honestly about some very ordinary Father, who found himself at times just a few jumps ahead of his creditor and no personal skills or influential friends to lean upon when the going got tough. That a guy really had a Father who went through the wringer and always had to pinch and ponder the future financial outlays, and yet who came out of his trials and bothers without losing his decency or his kindness, dignity or self-respect is perhaps something to brag about.

I've seen the time long ago in my early teens when I would have been sorry to admit that we were hard up; and that I was almost ashamed to have my Father come into the classroom to give an old soldier's Memorial Day talk —after the custom of my home town. I guess many kids go through that foolish shrinking spell when their parents are none too well dressed or modern, and more than ever so when some peculiar physical trait is observable.

I confess it made me sink my head and blush when the afternoon program in school included a short speech on patriotism and war experiences which the old soldiers took turns in giving, because quite often my Father was assigned to do the honors himself. He had no blemish on his war record or personal integrity, but he came out of the fever and ague marshes of the South with traces of malaria which left him nervous and ill at ease on public occasions. He had a perpetual case of stage fright and his voice trembled and his legs shook. Yet he took the call to public duty unflinchingly and muddled through his talk somehow, usually winding up with a poem he had made up himself about some boys around the campfire on the evening before a battle. The other kids in school took it much better than I did, and clapped loudly when he finished, and made no wisecracks at me afterwards either. But I was relieved when the program ended and Father beat a hasty retreat to help fix up the floral bouquets for the graveyard exercises.

Personally I think he would have done much better had I not been in the audience. He was probably trying hard not to shame me. The next day during the big parade down Main street behind Luder's German cornet band I seldom felt anything but a rush of glory and warmth, as I beheld Pa and old Man Blowers trudging at the head of the Grand Army Post No. 14; the one serving as officer of the day—who commanded the "boys" to "fall in,"—and the other holding aloft the Stars and Stripes nicely balanced by a pole set in the socket of a leather belt. Behind the "veterans" came the soon-to-be veterans, members of the Gifford Guards, in light blue uniforms and flat-fronted kepis on their heads—later discarded for the broad felt hats and khaki in the Spanish-American war.

THIS WAS as close to national immortality as my Father and his old comrades ever got. I presume a faint reminder of it may still exist on succeeding Memorial Days when the iron flag-holders mounted on their graves bear faded, rain-washed bunting placed

there by a patriotic generation who never knew them, and the mournful winds from the river carry hints of another spring seedtime which they shall never see. They do not lie in Arlington or under marble emblems, but perhaps those grass-grown rural cemeteries prove just as comfortable as a bivouac for nameless private soldiers awaiting the morning and the reveille.

My Father was born in Bennington, Vermont, in 1841, in a family of seven children, his father a blacksmith on the village green. There was a flag pole on that greensward, for Dad told me about the cheering done by a few Democrats in Vermont at the victory of President Polk and how some wag shinned up the liberty pole to hang a cow "poke" atop it in simulation of the winner's name.

He had few memories of the Green Mountain State itself, although the traditions and legends and lore of the era and the region came easily from his lips, like the rhymes from the McGuffy readers, Ethan Allen and Ticonderoga, the duel between Henry Clay and John Randolph of Roanoke, old English hunting songs with their echo, "temer-ren-ten-ten," home-made game boards for Nine Men Morris, and nursery jingles like "Richard and Pritchard were two pretty men who got out of bed when the clock struck ten." These and anecdotes of the family coming west via Erie Canal, and the elder son who left with the drovers for the long overland journey to the gold rush at Sutter's Mill, were often recited on winter nights from his old armchair by the kitchen window.

Dad's mother was a Putnam, some distant kin of General Israel's. She had a twin sister who married and went west to settle in Wisconsin three years prior to the exodus of my Father's tribe to follow the same uncharted pathway. The correspondence between the twins led all other reasons for the migration, the rest of it being laid to restless itching for new places and a diminished income from the Bennington smithy amid its rugged and stubborn farm land. My Father was about seven years old when he went on that great adventure, probably giving no lingering backward glance at the Green Mountains—which by the way, he never saw again.

Anyhow, the reunion of the twins and their families took place at last in a little hamlet east of the Badger capital, from whence the pioneers went the next spring to locate in a scrub oak clearing among the sand hills—fertility being of less moment then than wood and fresh water. Some of their best neighbors were Winnebago Indians, with whose boys my Father ranged the fields and forests in his teens, with nary a hint of race prejudice or ancient grudges.

Something that was always deeply appreciated and long remembered by the western migrators was the invoking of original native humor and the ability to defend one's self against a bully. I find this trace in the tales of my Father too. One had to be lighthearted and strong to endure, I guess. If they had had what we have to enjoy perhaps their ideals would have been slightly different. But far from me ever belittling them, I honor their reliance upon themselves for happiness and security, such as it was.

IN THIS VEIN, I recall that my Father's chief delight was in memories of his uncle, the husband of the

(*Turn to page* 49)

Fig. 1. A modern, well-equipped rapid soil and plant test laboratory. For running soil tests only, the laboratory may be much simpler. The G.L.F.-Seabrook Farms Raw Products Research Division Laboratory, a portion of which is shown here, provides information for the fertilization and liming of 25,000 acres of South Jersey farms.

Let's Replace Guessing With Soil Testing

By Benjamin Wolf

Soil Chemist, Seabrook Farms Company, Bridgeton, New Jersey

EVERY FARMER needs to know whether each field on his farm has sufficient quantities of available nitrogen, phosphorus, potassium, calcium, magnesium, and trace elements to meet the needs of the particular crop he is growing. It is also as important to know whether soil conditions, such as acidity and organic matter, are sufficiently favorable to permit the ready movement of these nutrients from the soil into the plant. Much of this information can be supplied quickly and easily by obtaining a rapid soil test.

Rapid soil test results can give a wealth of information to the farmer. They can tell him whether each field has the proper "sweetness" or acidity for crops to be grown. Since crops vary as to their requirements from this standpoint, it is absolutely important that each field be adjusted to give maximum crop yields. If too acid, soil test results will tell the amounts and kind of lime needed to sweeten the soil. If too sweet, they will provide information concerning amounts of sulfur necessary to make it more acid. These tests will also provide information about the approximate amounts and kinds of fertilizer neces-

sary for production of good crops. They can give much information as to whether organic matter supplies are being maintained at satisfactory levels, and can well point out toxic conditions such as are produced by excess fertilizer or presence of alkali salts or salting from sea water. In other words, knowledge of the basic requirements for feeding maximum crops of high quality can be brought into a farmer's hands in a short time by these methods.

Necessity of Tests

Such information is necessary if we are to meet the soil requirements of the particular crop that is grown. Many factors other than soil conditions enter into producing a bumper crop. However, there is no possibility of such crops unless soil conditions are optimum or nearly so. It, therefore, is a necessity to adjust the lime and fertilizer applications, and other soil additions as well, to meet the exacting requirements of good crops. Properly correlated soil test results offer the best possible means of calculating the amounts and kinds of materials needed, since they provide knowledge as to what is lacking in the soil. As can be seen readily, they are starting points for making up soil deficits.

The amounts of fertilizers, lime, and other amendments that are called for are based on actual crop response at certain levels of soil nutrients as measured by rapid soil tests. Knowing the change from one level to another by different applications of materials on certain soils also helps in the interpretation of the tests. Such preliminary knowledge is necessary for properly using rapid soil test data but is of no direct concern to the farmer. Once such data are obtained, they can be used indefinitely in an area to advise farmers as to the approximate amounts and kinds of materials he needs to add to the soil. The farmer receives the results in terms of pounds per acre of a particular kind of lime, fertilizer, or other ingredient and he need only follow the recommendations given.

If a farmer does not have these results, he must guess every time anything is added to the soil. He may be a good guesser; but since the odds are all against him, more often he is not. The depleted, ruined lands of America are mute testimony of the fact that past generations were very poor guessers. The present generation of farmers is still largely guilty of guessing. We have learned to mine nutrients out of a soil faster than any people in the history of the earth. General intensification and the lack of animal manures have added problems of fertility unknown to our forebears. While today we have more knowledge as to how soil impoverishment may be eliminated, we will fail dismally unless we proceed to use this knowledge to the fullest extent.

Many so-called progressive farmers often are as guilty of guessing wrong as their less educated neighbors. Knowing the agricultural value of lime, a "progressive" farmer in the area used large amounts of lime annually. A recent analysis of the soil, however, showed that the applications had not been used judiciously. There were fields having a pH of 7.5, or slightly alkaline, while some fields had a pH of 5.0, or strongly acid. In growing spinach, which in this area does best at pH of approximately 6.0-6.5, that growing on the higher pH was chlorotic and unsalable, and the fields having pH of 5.0 hardly had a stand.

Results of Tests

Guessing in this case was expensive. It usually is. It would have cost the farmer in question no additional amount for lime if all fields were limed to a satisfactory level. The amounts of money his crop would have returned in one year by being grown at proper acidity levels would have amply paid for obtaining soil test results for years.

Results of rapid soil tests also offer a means of saving money in the cost

of fertilizers. For years Seabrook Farms Company has applied 1,000 to 2,000 pounds of a 4-12-8 fertilizer per acre for growing vegetable crops. At first there was a need for such applications because when land was taken over for vegetable production much of it was low in nutrients, particularly phosphorus. Such applications, year after year and sometimes two and three times per year for several crops, have built up supplies of phosphoric acid in the soil. Need for extra nitrogen to give a better balanced condition has been met by extra additions of cyanamid and side-dressings of soluble nitrogen. More recently experiments based on rapid soil tests have shown that extra nitrogen but much less phosphoric acid will give better crops. This year an 8-8-8 or 10-10-10 fertilizer in amounts supplying about 30 additional pounds of nitrogen but 100 pounds less phosphoric acid per acre was used on many fields. This change, besides offering better crops of better quality, will provide considerable savings on Seabrook Farms' 1947 fertilizer bill.

Not all fertilizer savings based on soil tests are as large. Seabrook Farms could make large savings only because large amounts of phosphoric acid have been used for years on about 18,000 acres. The savings of actual fertilizer for small operators may be small but a total of them in any area is impressive. For in any community, there will be a number of farmers using either wrong amounts or kinds of fertilizer or both. For example, there are fields requiring large amounts of nitrogen, others may require large amounts of phosphoric acid, and still others may need high potash. Certain fields may require large amounts of two of these nutrients but not of the third. It may well be that large amounts of nitrogen are called for, but instead of supplying the need, excess money is spent for other elements needed only in small amounts. Often mixed fertilizers are being used when single ingredients are called for. Unless a test is made, there is no way of knowing the special conditions or needs of each soil.

Applying the same kind of fertilizer and perhaps at the same amounts to each field, as often is done, results in considerable waste of fertilizer. If it were only the price of the fertilizer that is being wasted, the situation would not be too serious. However, when the wrong amounts or kinds are being used, crop yields are markedly affected. Supplying certain elements in excess while failing to supply others in sufficiency causes unbalance with poor yields or poor quality or both.

In terms of crop, the savings even for farms of small acreage are most impressive. The results from a soil test may mean a good crop or no crop.

TABLE 1. NUMBER OF RAPID SOIL TESTS REQUIRED TO DO A COMPLETE JOB OF SOIL TESTING FOR VARIOUS CROPS IN NEW JERSEY

Crop	Acres	Acres per sample	Sampled	Number of samples
Vegetables	136,000	5	annually	27,200
White potatoes	50,000	10	annually	5,000
Sweet potatoes	14,000	5	annually	2,800
Hay	227,000	10	once in 3 yrs	7,560
Fruits	37,000	5	annually	7,400
Grains (other than cereals)	72,000	10	annually	7,200
Cereals	230,000	10	annually	23,000
Pasture (plowable)	200,000	10	once in 3 yrs	6,660
Total	966,000	.....	.....	86,820

The soil tests in such cases may suggest additional fertilizer or lime. Payment of such increases will be in form of greater yields, prevention of crop failures, and production of good quality produce. To a livestock producer, good quality will be very helpful in increased stock production, more milk, less breeding troubles, better weight gains, etc. If produce is sold directly, good quality may be responsible for a profit when a loss would otherwise be expected. In this postwar world with its keen-competition-for-purchases appeal, this is apt to be especially true.

Testing Is Insurance

In a sense, results of soil tests are a form of insurance—insurance that there will be no large waste of fertilizer or lime applied and insurance of producing good crops. Such insurance is well worthwhile. To illustrate this point, we might consider the cost of soil testing in the State of New Jersey. From Table 1, about 90,000 samples would have to be analyzed each year to give complete soil test results on the 966,000 cropped acres. The cost of such analyses would run between $100,000 to $150,000. This seems like an impressive figure until we stop to realize that in 1945 New Jersey farmers spent close to $10,000,000 in purchasing some 245,000 tons of fertilizer and 186,000 tons of lime. Spending about $125,000 for soil tests would represent a cost of 1¼ cents in order to wisely use each $1.00 spent on fertilizer and lime. Viewed from a different angle, New Jersey farmers in 1945 produced approximately $120,000,000 of farm crops. A cost of $125,000 to insure a $120,000,000 item is operating at a rate of a little over 0.1%. This is a much lower rate than these farmers paid to insure their dwellings, buildings, livestock, or machinery against loss by fire. Unlike fire insurance, money spent for crop insurance through rapid soil tests actually increases the value of article insured.

Considered from every angle, rapid soil tests are worthwhile and are urgently needed if we are to do an intelligent job of farming. How then can we get such results to every farmer or nearly every farmer in America?

Agencies for Testing

Most of the soil testing in this country today is done by state and federal agencies such as experiment stations or extension services. Such work is done free of charge or for only a nominal sum to cover cost of containers or postage. These organizations are not now equipped to handle the tremendous numbers of samples that are necessary to give each and every farmer soil test results. If all necessary samples were sent to these agencies, the service would completely bog down. Knowing this, there is a tendency on the part of agencies responsible for such testing to avoid advertising the work they are now doing just to prevent such a possibility. They could handle the load if sufficient funds were available. Sufficient funds also would help to make the soil testing results more accurate and useful by helping to supply information for proper interpretation of results. However, the $125,000 worth for the State of New Jersey is a big "if" and would not be appropriated unless farmers within the State knowing its value would demand such a service.

Commercial organizations also have done considerable soil testing work. Such organizations as large farms, food processors, and fertilizer companies have been engaged actively in testing soils. There are many more organizations of these types that can well afford to do soil testing on their own. Payment for such tests is in the form of increased crop yields or better quality of crops or good will and prosperity of the patron.

Recently, the author has suggested how the fertilizer industry may well use soil tests in conjunction with bulk

fertilizer spreading to completely revolutionize the fertilizer industry. Actual spreading of fertilizer would be done by the fertilizer company at rates and analyses suggested by rapid soil tests. Fertilizer mixed as needed would be spread immediately on farmers' fields. Elimination of storing mixed fertilizers, curing fertilizers, or of adding conditioner and elimination of bags and bagging would go a long way in paying for the added service of soil tests and fertilizer distribution. It remains to be seen to what extent the fertilizer industry will take advantage of the suggestion. If it does, this may be the most efficient way of handling the soil testing problem.

All of these methods (agency testing, commercial organization testing, or special fertilizer industry service) are not means of supplying rapid soil testing immediately to the many farmers who are now in need of it. To get this work started, it may be worthwhile for farmers' organizations to get together and do such testing on their own. In Illinois, a number of county laboratories for rapid soil testing have been established with the Farm Bureau underwriting the costs. These laboratories were set up by the Farm Adviser with help from the State University. Cost of setting up the laboratories has varied from $250 to $600. Farmers are charged at rate of 5 cents for each acidity determination, 10 cents for phosphorus determination, and 20 cents for potassium. Such charges are made to cover wages of the technician and the cost of testing materials. If samples are collected by the laboratory, a charge of 10 to 15 cents an acre is made for sampling service. In one county, a special service includes sampling, mapping of farm for lime, phosphate, and potash needs, and a visit by the Assistant Farm Adviser. The Farm Adviser discusses results of the tests and advises the farmer on lime and fertilizer applications as well as crop rotation. Charge for the complete service is at rate of 35 cents per acre.

The soil testing service by counties in Illinois is a most interesting innovation. It would be worthwhile for farmer groups everywhere to investigate these services. Other variations

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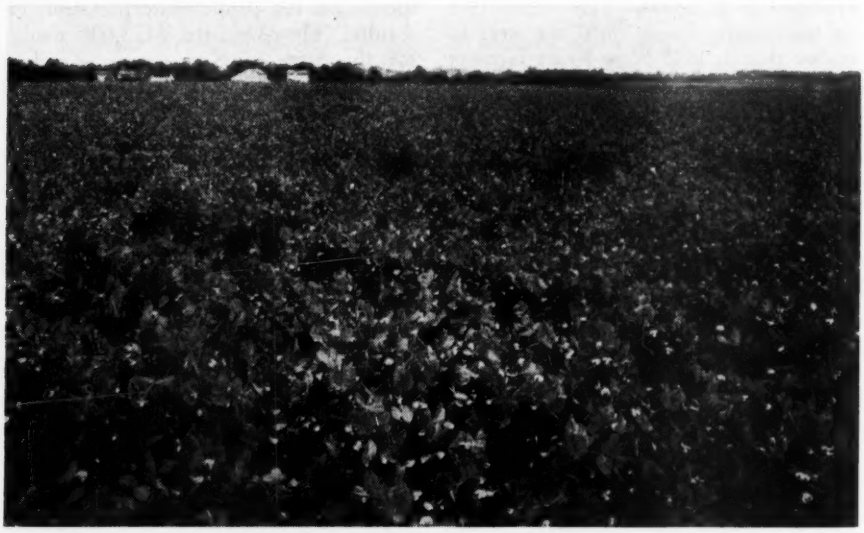

Fig. 2. A field of processing peas at bloom stage. Such fields of uniform, vigorous growth are possible only when all factors are at optimum. Use of rapid soil tests is an insurance that soil conditions for the crop are at optimum level.

From Broom Sedge To Beef Cattle

By Francis Murray

Associate Extension Editor, Purdue University, Lafayette, Indiana

YOU COULD TELL Paul Schaus, husky, middle-aged farmer of near Lamar in Spencer County, Indiana, to "go to grass" and he would hardly be offended. In fact he would very likely smile proudly and reply that he was already going to grass and plenty of it.

The story of Mr. Schaus and his triumphant conquest of erosion, low soil fertility, and a secure family income began a quarter century ago when he purchased a worn-out farm and simultaneously heard old-timers wonder out loud if he "was deliberately planning to starve to death."

A picture of that first 80 in the modest Schaus enterprise might have been described like this: The steep slopes were gashed viciously with gullies, the low ground was frequently flooded out, crops literally burned up in the hot dry summer days, a good corn crop averaged 35 bushels per acre, and legumes were too uncertain to speculate on. In addition, the buildings were in a similar state of collapse.

Fig. 1. Mr. Schaus uses barley for a winter cover crop because it yields good, makes good feed, and is hardy. He gets yields higher than his wheat yields would be. Here he is shown with a sample in one of his barley fields.

Paul had assembled all his formal education in the one-room school at the edge of the farm, but his thirst for new knowledge and his ability to observe and listen were boundless. Early in his struggle to improve productivity of his land, Paul went to the county seat and sought information at the office of the county agricultural agent. He studied crop rotations, new varieties, fertilizers, and drainage. He attended community crop schools and applied new management methods. Added to all these, he was a tireless worker who had good common sense.

Here is an example of Paul's determination to apply what he learned to his own impoverished land. He had been plagued by overflows caused by spring rains that rushed from a steep slope into a flat low area, invariably drowning out the crops. One day after a super "goose-drowner" he called county agent C. L. Dyer and suggested that he would like to try a series of diversion terraces on the hillside above the overflow land and asked the county agent to help lay them out.

That was 15 years ago. It was before field terracing was used in Indiana, particularly on southern hill farms. The terracing equipment included a

two-horse breaking plow and a slip scoop. It was a slow, difficult job.

"Many a time during that first year," Paul recalls, "I would run to the hillside in the pouring rain and shovel earth frantically to patch low places where the water threatened to break out of the terraces. The first year of the new terraces the low land produced a good wheat crop, and it has been producing good crops ever since."

In the very community where more than a century ago Abraham Lincoln was splitting rails and hoeing corn, Schaus was pioneering in soil conservation. The initial terraces were only a few hundred feet long. More than a mile of them wind around the steep slopes on his farm now.

Eight years ago, Schaus, a cooperative responder to new and practical farming advice, was asked by Purdue University to permit his farm to be used for some soil fertility test demonstrations. Extension service officials had selected the Schaus farm because it was typical of the condition of hundreds of others in southwestern Indiana.

Subsequently, a specialist from the University and the county agent suggested a plan. It called for longer rotations, heavier and higher analysis fertilizer applications, liming, strip or contour cropping, and more attention paid to the permanent pasture program. Some of the fertilizer was TVA superphosphate obtained through the University extension service.

Each year, under the new plan, Schaus has been stepping up fertilizer applications, and adding to his liming and pasture program. As a result, grass and legume crops are growing abundantly on hillsides once covered with broom sedge, corn yields have passed the 100-bushel-per-acre mark, and pasture carrying capacity has jumped from 1,750 pasture days to 6,000 pasture days per year.

A shotgun mixture including clover, timothy, alfalfa, and brome became a standard crop until recently when Schaus seeded one field to ladino clover.

Schaus has turned his farm enterprise into a rather unique combination.

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Fig. 2. This field had been flooded by spring rains which poured from the hill at left. Diversion terraces shown were built with a walking plow and slip scoop nearly 15 years ago. Schaus saved the crop the first year and each year from then on. Contour plowing and strip cropping also are being employed in controlling erosion.

Field showing the second crop of alfalfa. Manure was used on the entire piece. On the left, 150 pounds of muriate of potash; on the right, none. Response is very clear.

The Potash Fertilization of Alfalfa in Connecticut

By R. I. Munsell

Department of Agronomy, University of Connecticut, Storrs, Connecticut

THE oldest agronomic project still active at the Storrs Experiment Station is the response of alfalfa to soil treatments. Early in the history of the project, the importance of applying potash for alfalfa became apparent. In recent years, increasing difficulty has been experienced in maintaining alfalfa stands on Connecticut dairy farms for more than two or three years. In seeking a solution to this problem, rates and frequency of potash application were investigated in some detail.

Most of the tilled land in Connecticut has been cropped for 200 years or more. The soils were never very fertile. The present low reserve of relatively available potash may be due to past farming practices. As a result of poor storage and improper methods of application of farm manure, only a small part of the potash in animal voidings was returned to soil. And, even since commercial fertilizers have become available, relatively small amounts of potash have been used on alfalfa.

In seeding alfalfa, it has usually been recommended that sufficient minerals be applied to last through the average life of the stand. However, on a number of dairy farms, it was found that alfalfa seedings responded to additional potash,

TABLE 1.—K APPLICATIONS AND STANDS OF ALFALFA

K treatments		Stands at consecutive cuttings (%)					
No.	Time	1st	2nd	3rd	4th	5th	6th
1	August 1941	95	91	81	71	61	56
2	August 1941, 1943	96	83	73	66	61	64
3	August 1941, 1942, 1943	96	87	88	85	76	83
6	Every June and August	95	87	79	76	70	68
9	Every April, June, and August	96	94	90	81	76	78

even where manure was applied regularly. The high requirements of alfalfa for potash and the rapidity of potassium absorption when the supply in available form is large raised the question of the feasibility of adding enough potash at the time of seeding to last the crop through its probable life.

To obtain more information on this question, an experiment was started in August 1941. It was located on Charlton fine sandy loam soil on a field that had grown alfalfa since 1934. The pH of the soil was about 6.0 and the exchangeable bases totaled 6.5 milliequivalents per 100 grams of soil. The old stand of alfalfa had been plowed in May, and the land fallowed until August when Ontario Variegated alfalfa was seeded on all plots. The entire field received 47 per cent superphosphate at 300 pounds per acre. On this seeding, five different methods of applying potash were tested on quadruplicated plots, 52 x 11.5 feet. Each plot received the same total amount of potash during the three-year period 1941-44. The total application in each case was 360 pounds of K_2O per acre. The five treatments were:

(1) All of the potash disked in before seeding.
(2) Two-thirds of the potash disked in before seeding and one-third top-dressed in August 1943.
(3) One-third of the potash disked in before seeding and one-third top-dressed in August of 1942 and 1943.
(4) One-sixth of the potash disked in before seeding and one-sixth top-dressed in June and August of 1942 and 1943 and June of 1944.
(5) One-ninth of the potash disked in before seeding and one-ninth top-dressed in April, June, and August of 1942 and 1943 and April and June of 1944.

In 1942, 1943, and 1944, the alfalfa was cut twice per year following a 45- to 50-day growing period. Samples of pure alfalfa were selected immediately after cutting and these were analyzed for Ca, Mg, and K. The total yields of dry matter, including any volunteer

TABLE 2.—K APPLICATION AND CA IN ALFALFA

K treatments		Ca in consecutive cuttings M.E./100 grams dry matter					
No.	Time	1st	2nd	3rd	4th	5th	6th
1	August 1941	66	56	90	95	105	105
2	August 1941, 1943	73	66	101	103	99	104
3	August 1941, 1942, 1943	80	68	94	96	98	96
6	Every June and August	85	63	93	90	92	90
9	Every April, June, and August	82	66	97	93	97	100

TABLE 3.—K APPLICATION AND K IN ALFALFA

K treatments		K in consecutive cuttings M.E./100 grams dry matter					
No.	Time	1st	2nd	3rd	4th	5th	6th
1	August 1941	67	59	51	35	33	25
2	August 1941, 1943	54	51	33	29	37	27
3	August 1941, 1942, 1943	47	45	47	35	39	34
6	Every June and August	44	42	42	37	34	32
9	Every April, June, and August	47	45	35	38	36	37

grasses, were determined for each cutting. Any significant differences in total yields of the alfalfa as a result of fertilizer treatment were masked by the presence of volunteer grasses such as quack grass (Agropyron repens (L.) Beauv.).

The stands of alfalfa were estimated at least twice each season. The relationship between potash treatment and stands of alfalfa is brought out by table 1.

During the first harvest year, the stands were uniform for all K treatments. Under treatment No. 2, the stands decreased until the final third of the K was added in August 1943. At the end of three years, the poorest stand resulted from the first treatment where all of the K was applied at time of seeding. The best stand was maintained by treatment No. 3 where the K was added annually in equal amounts.

Chemical analysis showed that the rate and frequency of K treatment had considerable effect on the chemical composition of the alfalfa. In table 2 are given the Ca analyses for each cutting.

A single, heavy application of K before seeding depressed the Ca content of alfalfa markedly in the first and second cuttings and somewhat less so in the third and fourth cuttings. Except in the first cutting, applying two-thirds of the total K before seeding did not depress the amount of Ca in the alfalfa when compared with more frequent K treatments.

In table 3 will be found the K analyses of the six consecutive cuttings.

The effect of a single, heavy application of K before seeding was to give an increase in K content for the first three cuttings. Withholding one-third of the K until the end of the second year gave the lowest K content in the third and fourth cuttings. Dividing the K treatments into annual, semi-annual, and three times per year applications gave a more uniform content of both Ca and K for all six cuttings.

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TABLE 4.—K APPLICATIONS AND TOTALS OF CA, MG, AND K

K treatments		M.E./100 grams dry matter			
No.	Time	3rd	4th	5th	6th
1	August 1941	158	151	158	150
2	August 1941, 1943	153	155	155	148
3	August 1941, 1942 and 1943	159	152	155	148
6	Every June and August	154	148	144	141
9	Every April, June, and August	151	152	148	156

Fertilizer Placement for Corn On Sandy Soils of Minnesota

By J. M. MacGregor

Division of Soils, University of Minnesota, St. Paul, Minnesota

Fig. 1. Applying the fertilizer in the hill on the Sherburne County field.

FERTILITY experiments on the value of deep placement of commercial fertilizer by means of the "plow-under" method have been conducted by members of the Division of Soils, University of Minnesota, since 1942. Three years of investigation using commercial fertilizers at rates up to 1,000 pounds per acre on several finer textured soil types of the so-called "corn belt" in southwestern Minnesota demonstrated that in years of average precipitation the new placement method was probably not superior to fertilizing in the hill. Since investigators at the Indiana Station had secured excellent results with deep-fertilizer placement on the less fertile soils of that State, it was decided to initiate placement studies on the comparatively less productive sandy soils of Minnesota, of which there are some five million acres that might be utilized for agricultural purposes.

Four representative sandy land fields were selected in the spring of 1945, and several fertilizer combinations were applied at different rates on the "plow sole." Field corn was planted on two of these fields and navy beans on the two remaining. The amount and distribution of rainfall during the growing season of 1945 left little to be desired, and the response to fertilization, particularly to the application of nitrogen, was substantial. However, fertilizer applied to the corn in the hill also produced comparable increases in yield. Since the deep placement of fertilizer theoretically should encourage the development of roots more deeply in the soil than fertilizer placed more closely to the soil surface, the deep-placement method should have a decided advantage if drouth conditions should develop at any time during the growing season. The 1945 sandy land experiments demonstrated that the sandy lands were responsive to fertilization regardless of the method in which the fertilizer was applied.

Early in 1946, one field was selected as representative in each of the four counties of Anoka, Sherburne, Isanti, and Chisago. Six fertilizer treatments were applied on the plow sole in duplicate randomized plots 14 feet wide and 189 feet long. The corn was planted using a 42-inch x 42-inch spacing.

TABLE 1.—THE EFFECT OF FERTILIZER PLACEMENT FOR CORN ON HUBBARD LOAMY FINE SAND. ANOKA COUNTY, MINNESOTA, 1946

Applied plant nutrients, lbs./A			Increased yield over check plots (3.0 bu. and 0.55 tons fodder)			
			Ear corn in bu./A		Corn fodder in tons/A	
N	P_2O_5	K_2O	Hill-dropped	Plowed-under	Hill-dropped	Plowed-under
20	0	0	1.1	0.2	0.16	0.19
40	0	0	2.1	4.1	0.22	0.22
0	20	20	0.9	7.1	0.10	0.13
0	40	40	0.8	1.5	0.17	0.15
20	20	20	1.6	2.4	0.16	0.20
40	40	40	1.2	5.4	0.24	0.25
Average increase for fertilizer			1.3	3.5	0.18	0.19

The six fertilizer treatments were also applied in the hill in adjacent plots, and all treatments were later thinned to two stalks per hill. Yield samples were selected at random from the inner two rows of each plot at harvest time. Precipitation records were kept at each field during the entire growing season.

The soil types of the four experimental fields were not identical, but were typical of the area. Rainfall was abundant at all four locations until the end of June with the months of July and August being extremely dry for three of the fields. Early in September, the corn was further damaged by frost. Since rainfall deficiency varied at each location, the results of each field will be discussed individually.

1. Anoka County Field—Hubbard Loamy Fine Sand.

The rotation or sequence of crops

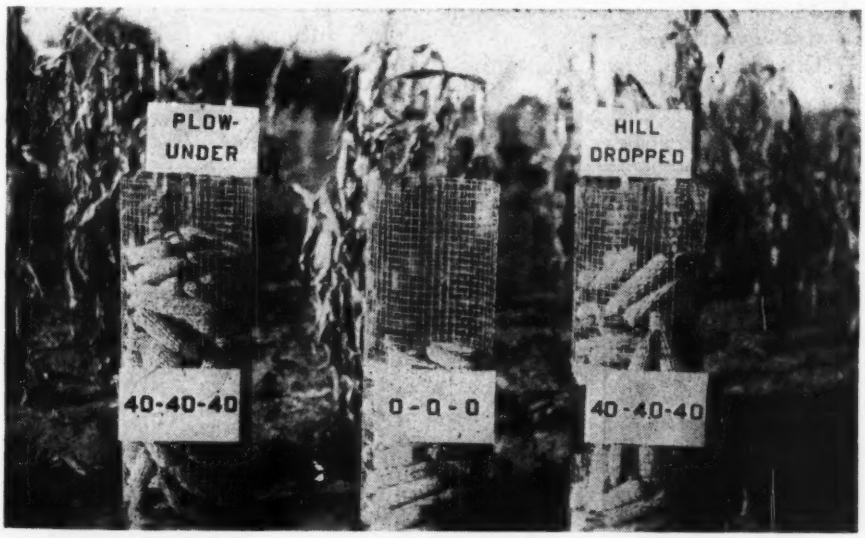

Fig. 2. Effect of fertilizer placement on yield of ear corn of the Sherburne County field.

TABLE 2.—THE EFFECT OF FERTILIZER PLACEMENT FOR CORN ON ZIMMERMAN LOAMY FINE SAND. SHERBURNE COUNTY, MINNESOTA, 1946

Applied plant nutrients, lbs./A			Increased yield over check plots (19.1 bu. and 0.87 tons fodder)			
			Ear corn in bu./A		Corn fodder in tons/A	
N	P_2O_5	K_2O	Hill-dropped	Plowed-under	Hill-dropped	Plowed-under
20	0	0	2.9	0.0	0.09	0.06
40	0	0	6.1	6.6	0.10	0.23
0	20	20	2.4	3.3	−0.02	0.08
0	40	40	5.6	2.7	0.19	0.11
20	20	20	6.8	7.8	0.09	0.16
40	40	40	6.9	7.0	0.10	0.19
Average increase			5.1	4.6	0.09	0.14

practiced was one of rye, corn, corn, corn. Rainfall for July and August totaled 1.37 inches, compared to an average normal of 6.61 inches for the two-month period. This deficiency severely affected the yield, but it was interesting to note that the corn with deep-placement fertilizer made much better growth than where fertilizer was applied in the hill. However, the extreme drouth and low water-holding capacity of the soil resulted in extremely low yields as shown in table 1.

2. *Sherburne County Field—Zimmerman Loamy Fine Sand.*

This field had been comparatively well managed with a clover, corn, rye, corn rotation being practiced.

The total rainfall for the July-August period was 1.73 inches compared with a normal period fall of 6.94 inches. No consistent growth differences due to fertilizer placement were noted during the growing season and figure 2 was taken at the time the corn was harvested. The yields of corn obtained are given in table 2.

3. *Isanti County Field—Zimmerman Loamy Fine Sand.*

All attempts to establish an alfalfa stand on this field had failed, probably

TABLE 3.—THE EFFECT OF FERTILIZER PLACEMENT FOR CORN ON THE MORE PRODUCTIVE PHASE OF ZIMMERMAN LOAMY FINE SAND. ISANTI COUNTY, MINNESOTA, 1946

Applied plant nutrients, lbs./A			Increased yields over check plots (29.4 bu. and 1.03 tons fodder)			
			Ear corn in bu./A		Corn fodder in tons/A	
N	P_2O_5	K_2O	Hill-dropped	Plowed-under	Hill-dropped	Plowed-under
20	0	0	6.6	1.4	0.30	0.12
40	0	0	9.8	4.5	0.49	0.26
0	20	20	0.9	−2.6	0.32	0.24
0	40	40	3.9	−2.1	0.30	0.11
20	20	20	13.1	1.8	0.56	0.19
40	40	40	18.3	9.9	0.87	0.51
Average increase			8.8	2.2	0.47	0.24

Fig. 3. Effect of deep placement of nitrogen on vegetative growth of corn in Isanti County.

due to a deficiency of lime. A rotation of potatoes, oats, corn, corn was being followed. Precipitation totaled 3.03 inches during July and August, which was approximately half the normal amount for this period. Although the soil type was the same as the previous field, occasional lenses of finer materials in the profile made it somewhat more retentive of water and the application of fertilizer showed more response as indicated in figure 3. The yields are given in table 3.

4. Chisago County Field—Berrien Loamy Fine Sand.

The water-holding capacity and general fertility of this soil were superior to the other three fields since the sand was underlain by a fine textured clayey subsoil at depths of three to four feet. Such soils often occur around the peri-

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TABLE 4.—THE EFFECT OF FERTILIZER PLACEMENT FOR CORN ON BERRIEN LOAMY FINE SAND. CHISAGO COUNTY, MINNESOTA, 1946

Applied plant nutrients, lbs./A			Increased yields over check plots (38.9 bu. and 1.37 tons fodder)			
			Ear corn in bu./A		Corn fodder in tons/A	
N	P_2O_5	K_2O	Hill-dropped	Plowed-under	Hill-dropped	Plowed-under
20	0	0	2.4	16.9	0.09	0.10
40	0	0	3.4	13.6	0.23	0.14
0	20	20	0.0	11.3	0.01	0.08
0	40	40	−2.4	6.4	0.01	−0.09
20	20	20	3.0	9.7	0.29	0.12
40	40	40	2.5	19.5	0.15	0.40
Average increase			1.5	12.9	0.13	0.13

Phosphorus: The Belle of the Soil

By George D. Scarseth

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CROPS do not use a large quantity of phosphorus, but what they do use is most important and the supply must be good. Crops use two to four times as much nitrogen and potash as phosphorus, but phosphorus is held so firmly by the soil that crops seldom get enough and farmers have had to spend annually about one hundred million dollars for this element as a fertilizer to add it in an available form to the soil. The phosphorus is chemically complex. It has many chemical handles with which to hang onto soil surfaces, and so does not move readily in the soil solution. I have compared phosphorus in the soil to a monkey in the jungle. One could not throw a monkey far through a thick jungle growth because arms, legs, and tail would soon catch a limb or vine to hang onto. Phosphorus likewise in the soil gets tangled up in many similar ways and tends to be hard to move and to be kept soluble and available.

Complex Behavior

To understand this complex chemical behavior, let us pretend that phosphorus is acting in a play as Miss Ortho Phosphate, highly attractive to Mr. Root Hair of the Plant Family. The stage is the soil and the scene of our first act is in a very acid room (soil at pH between 4.8 and 5.3). Along the walls of the room (colloidal surfaces) are numerous three-handed boys (trivalent, iron and aluminum oxides and hydrates) that have a great attraction for Miss Phosphate, who also has three hands. As long as these Iron and Aluminum boys have Miss Phosphate in this acid ballroom they can really strut their stuff and at once they are engaged and married. The marriage is made secure (insoluble) in the triple bonds of these hands. The knot is too secure (precipitates of insoluble iron and aluminum phosphates) for Mr. Root Hair to have much of a chance with his courting. He gets jilted and his poor mother, the Plant, starves because her son could not compete with this aggressive competition in such an unfavorable environment.

Addition of Lime

In the second scene, the room has been brightened up a bit with lime. There is just the faint trace of lime in the decorations (light liming to pH 5.3 to 6.0). But this change has proven allergic to the Iron and Aluminum boys for now they have lost a lot of their pep. They are, in fact, almost put out of commission (become insoluble) and the only time they can embrace Miss Phosphate is when she bumps occasionally into them as they sulk along the walls (absorption of phosphates by iron and aluminum in the clay particles). But once she touches the grabby hands of these sluggish, immobile Iron or Aluminum fellows she is really made a prisoner, held in a clumsy embrace (adsorption) but not nearly so snugly as when she was held by these same individuals when they danced about (soluble and mobile) in the first scene.

We notice in this second scene a big, dark, spongy fellow that in many physical respects resembles Mr. Clay Particle in which Iron and Aluminum are sandwiched. This dark chap answers to the name of Mr. Lignin Humate from the Family of Organic Matter. Strangely enough he tends to get into the hair of the Iron and Aluminum boys by getting in front of them to such an extent that these boys, who love Miss Phosphate so much, cannot touch her or hold her hands (protective colloid reaction). In fact, there is a rumor that this Humate fellow actually replaces Miss Phosphate at times by crowding her out of the embrace of these three armed bandits (anionic exchange). Mr. Root Hair enjoys having Mr. Humate around because he has discovered that Miss Phosphate is more free to give him some attention. In fact, in such situations Miss Phosphate is very likely to become annexed to the Plant Family.

The Happy Ending

The stage setting becomes a happy affair in scene three for here everything is sweetened up just right with lime (about pH 6.5). We find that the Iron and Aluminum boys are in jail (insoluble), and Miss Phosphate is keeping steady company with Calcium and Magnesium, the two sons of Old Man Dolomitic Lime. She is rather free to go to the Plant Family at any time, for whenever the door is open to the attractive boys, Calcium and Magnesium, they usually drag Miss Phosphate in, also (mono-calcium and mono-magnesium phosphates, slightly water-soluble).

It is interesting to note what happens if the stage becomes overdecorated with lime (overliming, pH above 7.0). Then Miss Phosphate and the Lime sons, especially with Mr. Calcium, go into such an embrace that they can hardly be moved (insoluble tri-calcium phosphate). Only a few of the relatives of the Plant Family as the Legumes are able to get them to move. The Legumes seem to have a better broom for sweeping them off their feet (root contact and action of excreted carbonic acid) than do their weaker relatives, the Grasses.

So, we come away from our play with the conclusion we liked the third scene best and that our hero, Mr. Root Hair, is further favored by having Mr. Humate around acting as the Jailer for the Iron and Aluminum boys and being otherwise generally helpful.

Method of Application

The behavior of phosphorus in the soil is extremely complex and this story is intended to illustrate only some of the chief characteristics. The practical advantages of correct liming, the addition of organic matter, and the use of legumes is implied. Phosphates do not move to any appreciable extent in the soil and are rapidly converted into unavailable forms when mixed thoroughly in the soil. For this reason they should be localized or placed with as little mixing with the soil as possible, as in bands. Top-dressing or high placement of phosphates for cultivated crops is not effective; on pastures where roots are near the surface top-dressing does satisfactorily. Of course, it needs to work in cooperation with the other nutrient elements because the plants will not respond well to additions of phosphates if one or more other nutrient elements are limiting.

If rock phosphate is used legumes must feed on it first for best results because this phosphate is in a naturally formed, insoluble tri-calcium phosphate that is available only through the action of carbonic acid to convert the phosphate to water-soluble mono-calcium phosphate, which can enter the plant. In superphosphates, the phosphate has been changed from the rock form to the water-soluble mono-calcium phosphate in the manufacturing process. Farmers can use both forms of phosphates in a

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Fig. 1. Urine spots in an alfalfa-brome grass field, May 15, 1945. (see Table)

Urine Spots Reveal Soil's Deficiencies

By D. R. Dodd

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THERE WERE many complaints in Ohio during the early spring of 1945 and 1946 about the slow and limited growth of grass pastures and hay fields. The dry season and close grazing of 1944 reduced the legume content in many fields. This reduced the amount of nitrogen that might be fixed by legumes. The cold weather of April in 1945 and 1946 prevented much nitrate formation and that formed doubtlessly was leached out of the soil to considerable degree by the excessive spring rains. However that may be, there were in the spring of 1945 and 1946 large responses to nitrogen fertilizer applications. The increased spring growth about urine spots of the fall of 1944 was also very pronounced. A good example of this fact was observed on a farm near Columbus on which some history and yield data were collected.

A seeding of alfalfa and brome grass was made in 1942. Along the fence a strip 20 feet wide was permitted to remain in Kentucky bluegrass. The field was used for hay and pasture in 1943 and pasture in 1944. Although the original stand of alfalfa was excellent, by the spring of 1945 it had declined until alfalfa made up only about 25

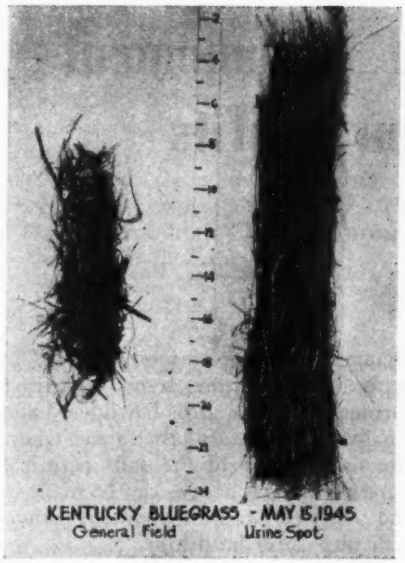

Fig. 2. The relative growth of Kentucky bluegrass on urine spots and adjoining areas. (see Table)

per cent of the alfalfa-brome grass vegetation. The field had been fertilized with 500 pounds of 0-12-12 when the alfalfa-brome was established. In the spring of 1944 it received about 10 tons of manure and 500 pounds of 0-14-7 per acre.

Fig. 3. The relative growth of alfalfa-brome grass on urine spots and adjoining areas. (see Table)

In spite of the liberal manure treatment, urine spots of the previous year showed much ranker growth than the surrounding areas in the spring of 1944. On the Kentucky bluegrass strip the urine spots were especially prominent. In the spring of 1945, these urine spots were again very pronounced.

In order to get some idea of the difference in growth between the urine areas and the remainder of the field, comparable areas were harvested, the vegetation dried, and the acre yields calculated for the different areas. The results are given in the following Table.

YIELDS IN POUNDS PER ACRE, AIR-DRY BASIS OF DIFFERENT TYPES OF PASTURE ON MAY 15, 1945

Type of pasture	Pounds of air-dry herbage per acre
Old Kentucky bluegrass	400
Urine spot in old Kentucky bluegrass	2,800
Brome grass with 25% alfalfa	1,135
Urine spot in the brome-alfalfa	3,405

The urine probably carried in solution about .8 per cent nitrogen, one per cent potash, and a trace of phosphate. All three nutrients were, of course, in a readily available form and probably contributed to the increased growth, but in consideration of the phosphate and potash otherwise applied, it would seem that probably nitrogen was the major factor contributing to this extra growth. This observation together with numerous others seems to indicate that low yields on grass pastures and hay fields frequently might be overcome by applications of appropriate fertilizers, particularly when the legume content is low. It is not presumed that the rate of application on

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Soil Fertility and Management Govern Cotton Profits

By H. B. Vanderford

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SUCCESSFUL farming is an enterprise that is governed largely by two important factors: the land, and the man or operator. The fact that variations occur in the productive capacity of soils throughout the country is well understood, but the limitations and agricultural possibilities of different soils are not always fully appreciated nor understood. A successful farmer or operator usually gets high efficiency from his land without exploiting the soil fertility at a detrimental rate, and in some cases over a period of time the fertility even may be increased.

Some soils by virtue of their fertility and physical properties have the capacity to produce high yields under very crude systems of management over a long period of time, while other soils require careful and extremely complex management practices in order to produce profitable yields. Good land can usually be used in many ways, whereas poor land generally has a limited number of profitable uses. Economic changes that force modifications in types of agriculture sometimes leave farmers in certain areas bewildered and finally bankrupt. In other areas, where the productivity of the soils permit a variety of uses, changes can be made in the pattern of farming without serious difficulties and hardships.

The Cotton Belt, sometimes referred to as the No. 1 problem area of the Nation, covers a wide range of climatic and soil conditions. The fertility levels of the soils vary from the lowest found anywhere in the whole United States to some that are relatively high. During the last 10 years Mississippi alone has produced, in addition to other crops, an average of approximately 1¾ million bales of cotton each year. This is more than any other state in the Cotton Belt produced except Texas. The yields per acre have naturally varied according to fertility levels of soils and management practices carried out on the farms. The average yield of all the acres planted to cotton in Mississippi during the last 10 years has been approximately 0.6

TABLE 1. COTTON PRODUCTION DATA ON FIVE FARMS WITH HIGH FERTILITY LEVELS

	500# bales per acre	Returns per acre	Cost per acre	Profit per acre	Labor returns per hour
	1.25	157.00	79.00	78.00	.780
	1.20	149.00	104.00	45.00	.820
	1.24	144.00	92.00	52.00	.450
	.90	107.00	47.00	60.00	.510
	1.10	137.00	67.00	70.00	.900
Average.....	1.14	139.00	78.00	61.00	.682

bales per acre. This means, of course, that yields on the soils of high fertility have raised considerably the average yields of low-fertility soils under comparable management.

Many of the soils of Mississippi and other southern states are low in inherent fertility and have suffered a loss of plant nutrients from leaching, erosion, and other soil-depleting processes. This being true, they would be expected to respond favorably to applications of commercial fertilizers. The Mississippi Experiment Station has obtained results from fertilizer tests which show that applying commercial fertilizers to cotton is a profitable procedure; nevertheless, there are still many locations in the State where cotton is grown with little or no added commercial nutrients.

In order to ascertain the influence of soil fertility and management on the profit made by producing cotton, some farm management studies were made in 1944 by the Department of Agricultural Economics in cooperation with the Division of Soils of the Agronomy Department of the Mississippi Experiment Station. In this study an attempt was made to measure the actual weight that can be placed on soil resources along with the management factor in terms of farm income obtained from the production of "King Cotton."

Nature of Study

At the outset of the investigation a number of farms that were producing cotton as the principal cash crop were selected, and detailed soil surveys giving an inventory of the soils, slopes, and erosion conditions on each enterprise were made. By studying the soil maps and making visits to the farms, a number of these farms which were high in fertility, a number which were medium in fertility, and a number which were low in fertility were selected for further study. All of these farmers were probably above the average in managerial ability and were willing to cooperate in the study.

The farms that were classified as having a high fertility level were located in the Black Belt portion of the Coastal Plain section or adjacent to it. The low-fertility farms were located in areas where sandy Coastal Plain soils predominate and fertilization was a common practice. The actual expenses involved in the production of cotton were recorded by the farmer under the direction of the agricultural staff member for the year 1944.

Soil Fertility and Net Income

It must be remembered from the outset that productivity is not independent of management. These are two variables that are important in the operation of a farm and are designated by the agricultural economist as two factors of production. The inherent fertility governs the productive possibilities of each soil type, but the management determines what per cent of the capacity is attained. In this study the management factor was in every

TABLE 2. COTTON PRODUCTION DATA ON FIVE FARMS WITH MEDIUM FERTILITY LEVELS

	500# bales per acre	Returns per acre	Cost per acre	Profit per acre	Labor returns per hour
	.90	118.00	89.00	29.00	.460
	.57	73.00	43.00	29.00	.500
	1.12	137.00	101.00	37.00	.820
	1.13	142.00	101.00	41.00	.460
	.43	54.00	34.00	20.00	.540
Average.....	.93	117.50	83.50	31.20	.550

case above the average, as indicated by the interest in keeping farm records. Data showing the cost of producing cotton on the high-fertility farms are given in Table 1.

It is interesting to note that there was some variation in the yields per acre on these farms, but the average yield on the five farms was 1.14 bales per acre. The gross returns in terms of dollars per acre were rather high and might be misleading if the costs of making the returns were not considered. However, the actual costs were obtained and deducted from the cash returns giving the profit received from each acre of cotton grown on the various farms. The cost of producing an acre of cotton was in every case high, and much variation in this item was recorded by the operators. This can be appreciated when it is remembered that farm labor was receiving high wages in 1944 and all farmers did not work the same number of hours in the cotton field. One extra cultivation or hoeing on one farm would make the cost of producing an acre of cotton considerably higher than the cost on a nearby farm where the operator was able to get by without the extra cultivation. Picking was another expensive process and some of the farmers had to pay $3 per hundred to get the cotton harvested. The value representing the profit on some of the farms amounted to $70 and the average profit obtained on all these farms was $61 for every acre of cotton produced.

It might be well to point out that the acreage devoted to cotton on these five farms that year averaged approximately 24 acres per farm. This will give an indication of the farm income from cotton alone; and it is well above the total income on many farms. On these farms there was a wide margin between the cash returns and the actual cost, which is a situation that means more profit to the farmer and a higher farm income. The fertility level was sufficiently high on some of these farms so that more than a bale of cotton was produced without any commercial fertilizer.

The data obtained on the farms that were classified as having a low fertility level are given in Table 2. These farms were somewhat smaller than the farms classified as high in fertility. The acreage planted to cotton varied from 5.5 to 25 acres, making an average of 14.6 acres per farm. The yields on these farms were lower than on the farms high in fertility, but for this particular year they were up to the State average. In comparison with the farms high in fertility, it is significant to note that the average cash return per acre on low fertility farms was less than the production cost per acre on farms of high fertility. The margin between cash return and cost per acre in this case was narrow. The operators of these farms were obtaining a profit on the average of only $12 per acre, whereas the farmers on the good land were receiving five times as much.

The farms classed as medium in fertility fit in between these two extremes insofar as profits were concerned. Data on these farms are shown in Table 3. It is interesting that the cost of production on the soils medium in fertility was highest of all. This was partly due to the cost of fertilizer added to the soils in an effort to overcome the deficiency in fertility. The average profit obtained on the six farms included in this study was $31.20 for each acre of cotton. The profit is more important to the farmer than the cost, and fertilizer used wisely usually pays high dividends in cotton production.

The results of this study, although of only one-year duration, indicate definitely that soil fertility is a basic factor in governing farm incomes and should be considered in all farm-management studies. Farming practices that have been successful on one farm may not be suitable for another farm in the same vicinity and may be still less suitable for a farm in another county

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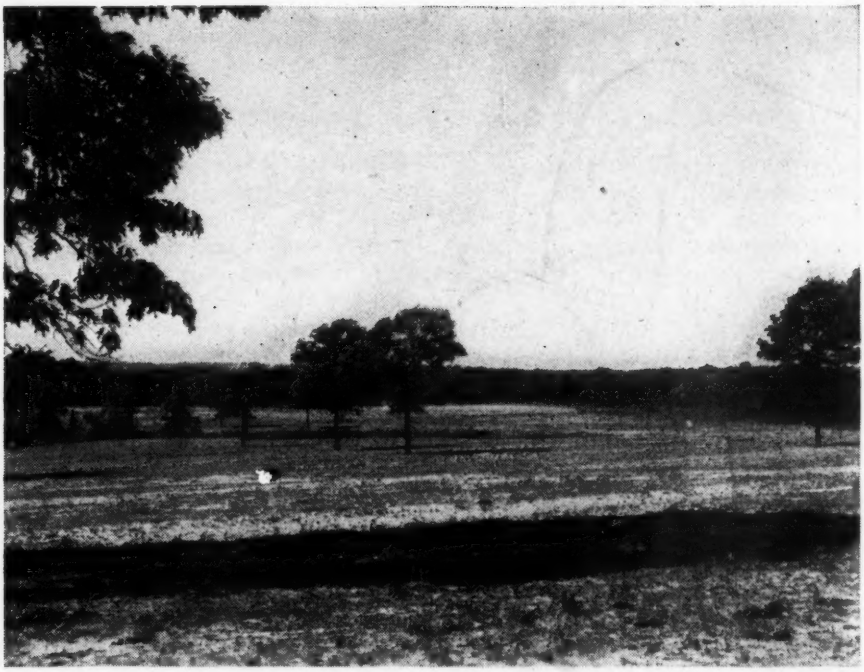
Above: **Fine homes with modern conveniences indicate soils high in fertility and good management.**

Below: **As the fertility declines and the topsoil is lost by erosion, the homes also deteriorate.**

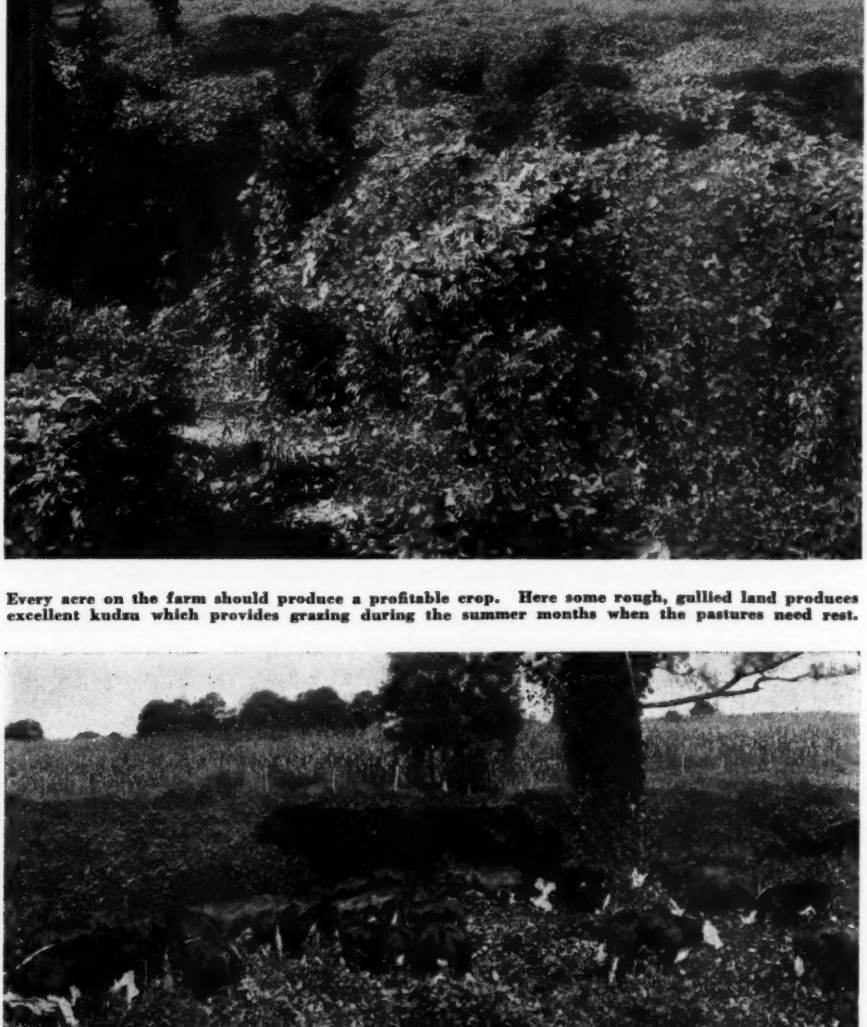


Above: **Idle land will provide some income for the farmer when prepared and managed as a pasture.**

Below: **White Dutch clover responds well to applications of lime, phosphorus, and potash.**

Above: **Poor, eroded, gullied land such as this is a liability to any farmer.**

Below: **The check plot shows the need for a complete fertilizer in this field of cotton.**



Every acre on the farm should produce a profitable crop. Here some rough, gullied land produces excellent kudzu which provides grazing during the summer months when the pastures need rest.

The Editors Talk

King Corn 1947

The eyes of the world have been turned on America's 1947 corn crop. Not only have the people in this country realized what a failure of the corn crop might mean in the way of food restrictions and higher prices, but the peoples in war-ravaged countries saw in such a catastrophe lessened possibilities for obtaining the wheat and other food products to stave off starvation this coming winter.

So great has been the interest in the matter that special corn reports—weekly surveys of progress in the Corn Belt as to stage of maturity and how much "soft" corn may result from killing frosts—are being made by the Crop Reporting Board. The first one appeared on September 19 based on September 12 data from the field. The reports are released on Friday of the week. The last one (as of October 3) stated that 87 per cent of the corn acreage in 12 Corn Belt states was largely safe from frost. Over the area as a whole the week ending September 19 was extremely favorable for corn maturity. It now is estimated that the total crop will be 2.6 billion bushels, which is about the average of the past 10 years, but only four-fifths of last year's record high.

Back of this lies another telling example of American achievement. Determined to produce a bumper crop this year, our farmers encountered an unusually cold and very wet spring, with serious floods in many areas delaying planting to critical dates. Every ingenuity had to be employed to get the corn into the ground, and much of it had to be replanted. This never could have been accomplished were it not for widespread mechanization, in the way of tractors and improved planting equipment, which has cut time and labor factors. Even so, many a tractor was run day and night.

Next came the use of hybrids, with much of the late planting being done with short season strains. The development of hybrid corn and its amazing effects upon increasing our corn yields are well known. Few are the acres now planted to open-pollinated strains.

Recent research on balanced fertilizers for corn and on corn population per acre was put to work. More acres were fertilized with greater amounts per acre. In order to utilize the additional fertilizer, heavier rates of planting were employed. This combination is resulting in significant increases in yields. Pest control was studied and practiced and the growing crop was carefully watched.

On August 1, when it became apparent that despite all of these efforts, early frosts might get as much as 200 million bushels of the crop, an intensive combined Federal, State, and private research program to develop portable corn-drying equipment for farm or community use was authorized as the first research project under the Research and Marketing Act. This emergency corn-drying project got under way without delay with four U. S. Department of Agriculture bureaus correlating their efforts and cooperating with experiment stations in the Corn Belt States. A few driers meeting specifications already have been purchased for demonstration purposes. With the most critical time for spoilage of soft corn in

the winter or early spring, it is safe to say that this project will result in the use of enough driers to take care of a large percentage of the immature corn.

Corn is grown in every state of the Union. It is fortunate for the Nation that some of the states outside the Corn Belt have had better weather. The South is learning how to grow corn. Yields comparing well and even topping some of the yields in the Midwest are being obtained in North Carolina. It is estimated that this State will realize its highest average yield this year and that this average will surpass the highest average of the Corn Belt.

When the final corn picture for 1947 is drawn, it cannot help but prove a tribute to American agricultural science and the American farmers who are putting it into practice. And history may prove that at no other time has this combination done more for the benefit of all mankind.

Soil Fertility

What is it? According to G. B. Whiteside of the Dominion Experimental Station, Charlottetown, P. E. I., soil fertility is the capacity or quality of the soil necessary to supply plant nutrients in sufficient amounts and in the correct balance for the growth of plants when factors such as temperature, moisture conditions, and the physical condition of the soil are favorable. A good and inclusive definition, in our opinion!

He goes on to explain that soil fertility is not just a matter of the percentages of plant food constituents in the soil, but that it involves several other factors. Not only is it essential to have an adequate supply of plant nutrients in a form readily available for plant use, but to have them present in a proper relationship or balance, one to another. An excess of one nutrient element may result in restricted plant growth and lowered yields just as will an insufficiency of a plant-food constituent.

Soil reaction or the degree of acidity is also important in soil fertility. Where the soils are very acid, the availability of plant nutrients will be reduced. Soil reaction also influences the number and activity of soil organisms and may cause a reduction in the soil population resulting in the lowering of many soil activities.

To be fertile a soil must be in good tilth, permitting the free development of plant roots and allowing for the free movement of air and water while at the same time enabling the soil to retain enough water for plant growth. The tilth or physical condition of the soil will in large measure be determined by the amount of humus which is essential to a fertile soil. Humus will help to make plant nutrients available and help to conserve and maintain them in a proper balance, as well as being a source of nutrients.

Mr. Whiteside believes that soil fertility is not just a question of a supply of plant nutrients, but also of a proper soil environment. To maintain and build up a high state of soil fertility will require a well-balanced soil management program designed to supply organic materials and lime as well as mineral fertilizers, to include crop rotations, grassland management, and protection for bare plowed or cultivated land.

When people try to live by getting more out of the land and out of each other than they give back, the community sickens and may die. But it has been shown that when they take care of the land and each other, they are likely to find eventual security through this stewardship of their physical and human resources.—*Arthur Raper.*

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb.	Tobacco Cents per lb.	Potatoes Cents per bu.	Sweet Potatoes Cents per bu.	Corn Cents per bu.	Wheat Cents per bu.	Hay Dollars per ton	Cottonseed Dollars per ton	Truck Crops
	Aug.-July	.....	July-June	July-June	Oct.-Sept.	July-June	July-June	July-June	....
Av. Aug. 1909–July 1914	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1922	22.9	22.8	65.9	100.4	74.5	96.6	11.64	30.42	....
1923	28.7	19.0	92.5	120.6	82.5	92.6	13.08	41.23	....
1924	22.9	19.0	68.6	149.6	106.3	124.7	12.66	33.25	....
1925	19.6	16.8	170.5	165.1	69.9	143.7	12.77	31.59	....
1926	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937	8.4	20.4	52.9	82.0	51.8	96.2	8.74	19.51	....
1938	8.6	19.6	55.7	73.0	48.6	56.2	6.78	21.79	....
1939	9.1	15.4	69.7	74.9	56.8	69.1	7.94	21.17	....
1940	9.9	16.0	54.1	85.5	61.8	68.2	7.58	21.73	....
1941	17.0	26.4	80.7	94.0	75.1	94.5	9.67	47.65	....
1942	19.0	36.9	117.0	119.0	91.7	109.8	10.80	45.61	....
1943	19.9	40.5	131.0	204.0	112.0	136.0	14.80	52.10	....
1944	20.7	42.0	149.0	192.0	109.0	141.0	16.40	52.70	....
1945	22.4	42.6	139.0	200.0	114.0	149.0	15.10	51.80	....
1946									
September	35.30	48.8	128.0	224.0	173.0	179.0	15.40	57.80	....
October	37.69	53.0	122.0	209.0	171.0	188.0	16.10	66.00	....
November	29.23	43.8	123.0	200.0	127.0	189.0	17.20	89.90	....
December	29.98	43.5	126.0	210.0	122.0	192.0	17.70	91.50	....
1947									
January	29.74	39.0	129.0	220.0	121.0	191.0	17.50	90.40	....
February	30.56	31.9	131.0	228.0	123.0	199.0	17.50	88.20	....
March	31.89	33.6	139.0	235.0	150.0	244.0	17.40	88.00	....
April	32.26	30.1	147.0	233.0	163.0	240.0	17.20	88.00	....
May	33.50	44.6	153.0	233.0	159.0	239.0	16.80	83.70	....
June	34.07	46.0	156.0	249.0	185.0	218.0	16.00	79.60	....
July	35.88	48.5	169.0	251.0	201.0	214.0	15.10	79.00	....
August	33.15	38.1	161.0	270.0	219.0	210.0	15.30	75.50	....
Index Numbers (Aug. 1909—July 1914 = 100)									
1922	185	228	95	114	116	109	98	135	....
1923	231	190	133	137	129	105	110	183	....
1924	185	190	98	170	166	141	107	147	143
1925	158	168	245	188	109	163	108	140	143
1926	101	179	189	134	116	138	112	98	139
1927	163	207	146	124	132	135	87	154	127
1928	145	200	76	134	131	113	95	152	154
1929	135	183	189	133	124	117	92	137	137
1930	77	128	131	123	93	76	93	98	129
1931	46	82	66	83	50	44	73	40	115
1932	52	105	55	62	50	43	52	46	102
1933	82	130	118	79	81	84	68	57	91
1934	100	213	64	91	127	96	111	146	95
1935	90	184	85	80	102	94	63	135	119
1936	100	236	164	106	163	116	94	148	104
1937	68	204	76	93	81	109	74	87	110
1938	69	196	80	83	76	64	57	97	88
1939	73	154	100	85	88	78	67	94	91
1940	80	160	78	97	96	77	64	96	111
1941	137	264	116	107	117	107	81	211	129
1942	153	369	168	136	143	124	91	202	163
1943	160	405	188	232	174	154	125	231	245
1944	167	420	214	219	170	160	138	234	212
1945	181	435	199	228	178	169	127	230	224
1946									
September	285	488	184	255	269	202	130	256	154
October	304	530	175	238	266	213	136	293	151
November	236	438	176	228	198	214	145	399	207
December	242	435	181	239	190	217	149	406	166
1947									
January	240	390	185	351	188	216	147	401	238
February	246	319	188	260	192	225	147	391	275
March	257	336	199	268	234	276	147	390	299
April	260	301	211	265	254	271	145	390	295
May	270	446	220	265	248	270	142	371	286
June	275	460	224	284	288	247	135	353	215
July	289	485	242	286	313	242	127	350	189
August	267	381	231	308	341	238	129	335	211

Wholesale Prices of Ammoniates

	Nitrate of soda per unit N bulk	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory, bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1923	3.02	2.90	6.19	4.83	4.59	5.16
1924	2.99	2.44	5.87	5.02	3.60	4.25
1925	3.11	2.47	5.41	5.34	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946						
September	2.22	1.46	10.32	6.95	6.07	12.14
October	2.22	1.46	13.20	7.12	8.30	12.14
November	2.22	1.46	15.19	11.26	12.14	12.75
December	2.22	1.46	14.63	11.37	12.14	11.17
1947						
January	2.36	1.46	12.98	11.06	12.14	10.32
February	2.41	1.46	10.01	11.06	12.14	10.17
March	2.41	1.46	11.98	11.06	12.50	10.50
April	2.41	1.51	11.72	10.79	12.75	11.39
May	2.41	1.51	10.55	9.98	12.75	8.80
June	2.41	1.51	10.94	9.98	12.75	8.26
July	2.41	1.59	12.56	9.98	12.75	8.66
August	2.53	1.60	13.01	9.98	12.75	8.73
Index Numbers (1910-14 = 100)						
1923	112	102	177	137	136	147
1924	111	86	168	142	107	121
1925	115	87	155	151	117	135
1926	113	84	126	140	129	139
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	12	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946						
September	83	51	295	197	180	345
October	83	51	377	202	246	345
November	83	51	434	319	360	362
December	83	51	418	322	360	317
1947						
January	88	51	371	313	360	293
February	90	51	286	313	360	289
March	90	51	342	313	371	298
April	90	53	335	306	378	324
May	90	53	301	283	378	250
June	90	53	313	283	378	234
July	90	56	359	283	378	246
August	94	56	372	283	378	248

Wholesale Prices of Phosphates and Potash **

	Superphosphate Baltimore, per unit	Florida land pebble 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[1]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1923	.550	3.08	7.50	.588	.836	23.32	....
1924	.502	2.31	6.60	.582	.860	23.72	....
1925	.600	2.44	6.16	.584	.860	23.72	....
1926	.598	3.20	5.57	.596	.854	23.58	.537
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.9	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.570
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946							
September	.700	2.60	6.60	.471	.729	22.88	.176
October	.700	2.60	6.60	.471	.729	22.88	.176
November	.700	2.60	6.60	.535	.797	26.00	.200
December	.700	2.60	6.60	.535	.797	26.00	.200
1947							
January	.700	2.60	6.60	.535	.797	26.00	.200
February	.720	2.60	6.60	.535	.799	26.00	.200
March	.740	2.75	6.60	.535	.797	26.00	.200
April	.740	2.97	6.60	.535	.797	26.00	.200
May	.740	2.97	6.60	.535	.797	26.00	.200
June	.752	2.97	6.60	.330	.589	12.76	.176
July	.760	2.97	6.60	.353	.629	13.63	.188
August	.760	3.08	6.60	.353	.629	13.63	.188
Index Numbers (1910-14 = 100)							
1923	103	85	154	82	88	96	....
1924	94	64	135	82	90	98	....
1925	110	68	126	82	90	98	....
1926	112	88	114	83	90	98	82
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1920	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946							
September	131	72	135	66	76	95	80
October	131	72	135	66	76	95	80
November	131	72	135	75	84	108	83
December	131	72	135	75	84	108	83
1947							
January	131	72	135	75	84	108	83
February	134	72	135	75	84	108	83
March	138	76	135	75	84	108	83
April	138	82	135	75	84	108	83
May	138	82	135	75	84	108	83
June	140	82	135	60	62	53	80
July	142	82	135	64	66	56	82
August	142	85	135	64	66	56	82

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1923.....	143	152	147	114	107	144	103	79
1924.....	143	152	143	103	97	125	94	79
1925.....	156	156	151	112	100	131	109	80
1926.....	146	155	146	119	94	135	112	86
1927.....	142	153	139	116	89	150	100	94
1928.....	151	155	141	121	87	177	108	97
1929.....	149	154	139	114	79	146	114	97
1930.....	128	146	126	105	72	131	101	99
1931.....	90	126	107	83	62	83	90	99
1932.....	68	108	95	71	46	48	85	99
1933.....	72	108	96	70	45	71	81	95
1934.....	90	122	109	72	47	90	91	72
1935.....	109	125	117	70	45	97	92	63
1936.....	114	124	118	73	47	107	89	69
1937.....	122	131	126	81	50	129	95	75
1938.....	97	123	115	78	52	101	92	77
1939.....	95	121	112	79	51	119	89	77
1940.....	100	122	115	80	52	114	96	77
1941.....	124	131	127	86	56	130	102	77
1942.....	159	152	144	93	57	161	112	77
1943.....	192	167	151	94	57	160	117	77
1944.....	195	176	152	96	57	174	120	76
1945.....	202	180	154	97	57	175	121	76
1946								
September.	243	210	181	108	67	223	131	70
October...	273	218	197	115	67	286	131	70
November.	263	224	198	127	67	382	131	78
December..	264	225	204	127	67	376	131	78
1947								
January...	260	227	206	126	69	359	131	78
February..	262	234	209	124	70	329	134	78
March.....	280	240	216	128	70	354	138	78
April.....	276	243	215	129	71	354	138	78
May.....	272	242	215	127	71	339	138	78
June.....	271	244	215	125	71	343	140	63
July.....	276	244	219	128	72	359	142	67
August....	276	249	223	130	75	364	142	67

* U. S. D. A. figures. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

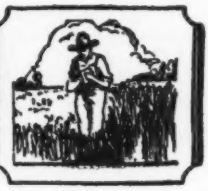
† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] **Since June 1941, manure salts are quoted F.O.B. mines exclusively.**

** **The weighted average of prices actually paid for potash are lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS



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Soil Management Practices in the Orchard

¶ Considerations that should be kept in mind in managing an orchard are covered by T. A. Merrill in "Soil Management Practices in the Orchard," Michigan Agricultural Experiment Station Circular 199. First consideration, of course, must be given to the question of whether the particular location is suited at all to growing of fruit trees. In this respect, drainage and condition of the sub-soil have to be given careful consideration. Different fruits and even different varieties vary somewhat in their tolerance of poorly drained or of excessively drained locations. Owing to the fact that air-drainage is desired as a partial protection against frost injury, orchard soils are frequently subject to erosion, and too frequently in the past the danger of serious soil loss due to this has been neglected.

The author points out the advantage of contour cultivation and lays great stress on using an adapted cover on the orchard soil. Several different types of cover are discussed, with sods consisting of grass or mixtures of grass and legumes apparently being most favored. It is admitted that there are differences of opinion concerning the desirability

of permanent grass sods especially for peaches, cherries, and plums, but the author feels that this can be handled successfully if the proper fertilization program is followed.

In establishing the cover crop, a fertilization adapted to the plant and the soil should be made so as quickly to establish a good cover. In many cases, 250 to 400 pounds of 0-20-20 per acre seem to be well adapted. If a permanent grass sod is maintained, high nitrogen fertilization must be provided. Some growers prefer an alternate middle method whereby alternate middles are sown to a cover to last one to three or four years, while the other middles are being cultivated. At the end of the period, the plantings are then reversed, so that over a period of years the entire orchard is covered half the time. The good features of mulching and trash cultivation also are discussed.

The author draws a distinction between fertilizing the cover crop and fertilizing the tree. The cover crop in general can be fertilized the same as if the crop were not being grown in an orchard. Trees admittedly have nutrient requirements similar to other plants, but the author calls attention to the fact that the trees occupy the land for a period of years and their roots are able to forage through a large volume of soil, so that their feeding power and fertilizer requirements may be somewhat different from those of the cover crop. On some soils, minerals such as potash, boron, magnesium, calcium, sulphur, phosphorus, and others are needed, and should be supplied if the soil does not furnish sufficient quantities. But in general, he feels that nitrogen should be the principal fertilizer for trees, while the minerals should be considered mainly in connection with the cover crop. Fertilization, of course, will not compensate for improper management from the viewpoint of disease and insect control, and best results from the orchard can be obtained only if all these factors are properly considered.

A Twelve-Month Grazing Program for the Rice Area of Louisiana

¶ A combination of rice-growing and cattle-raising is practiced in parts of Louisiana. The land is allowed to lie idle between rice crops, and cattle are grazed on the volunteer growth of grasses and weeds. Production records of the cattle as well as yields of rice have been unsatisfactory under this system, and the Louisiana Experiment Station undertook investigations on methods of improving the productivity of the land for both forage crops and rice. This work is reported by R. K. Walker and M. B. Sturgis in Louisiana Agricultural Experiment Station Bulletin 407, "A Twelve-Month Grazing Program for the Rice Area of Louisiana."

Pasture experiments were established at five different locations. While the treatments varied slightly, in general one area was left untreated, another area was seeded with a mixture of grasses and legumes, a third area was seeded and treated with 400 pounds of a complete fertilizer per acre at planting time (4-12-8, 3-12-12) and top-dressed after a year or two with 200 pounds of 0-12-12 per acre. A fourth plot would receive limestone in accordance with acidity of the soil in addition to the seeding and fertilizer. The plots were grazed and the animals weighed at 30-day intervals.

The results of the treatments are measured in terms of beef production per acre. The untreated plots and those just seeded in most cases produced very little beef, sometimes as low as seven pounds per acre and in all but four

cases less than 100 pounds per acre. The combination of fertilizer and lime along with seeding usually produced over 200 pounds of beef per acre and in many cases around 300 pounds. The good treatment would spread the grazing season on a higher level over a longer period of the year. A combination of lespedeza and oats would furnish forage during the winter. The lespedeza was cut for hay, the oats pastured through the winter and then harvested for grain. It was found that the grazing value of oats as a pasture was 92 pounds of beef per acre during the winter period. In addition 25 bushels of oats were harvested.

Not only did the pasture treatment program improve the beef production, but, at two locations where this work was carried on, it also increased the yield of rice sown on the pastures after they were plowed up. Part of the rice was treated with 200 pounds of 4-12-8 at planting time, while part was left unfertilized. In one case the unfertilized rice growing on the area which had not been treated for pasture produced six barrels per acre, while on the pasture area which had been given the best treatment the yield was over 17 barrels per acre. This yield was further increased to 19.2 barrels per acre by fertilizing the rice at planting time. There was less increase in yield of rice due to fertilization at planting time when the rice was planted on the well-treated pasture than when it was planted on the untreated pasture. Rather similar results were obtained at another location. The work in this Bulletin shows rice growers how to increase not only the yield of rice but also the production of beef.

Phosphorus: The Belle of the Soil

(*From page* 21)

farming system that contains legumes. The phosphates used in the starter fertilizers for corn and grains should be the immediately soluble forms as super or triple superphosphates. The kind of phosphate to use with respect to the content of phosphate depends chiefly upon the net costs when applied to the ground. In areas far removed from the raw materials the higher analysis becomes the more economical.

Let's Replace Guessing with Soil Testing

(*From page* 10)

may be tried and actual testing may be done more efficiently on a regional basis. No matter what variation is used, joint farmer action with costs apportioned to farmers taking advantage of the service seems to be a quick, efficient way of getting rapid soil tests to large groups of farmers.

The best possible solution for getting soil test results to all farmers may well be a combination of methods suggested. What may work well for one state or area may be inadequate for another. Such considerations will be worked out in time and to the best advantage of the majority. The important thing at present is to realize the necessity of soil tests and start immediately in bringing such tests to all farmers.

In bringing such tests to farmers, it is important that reliable methods

be used and they be correlated properly with crop response for the region in which they are going to be used. We now have methods accurate enough to do the job, if they are used intelligently. Such methods are simple and easy enough to be performed by persons of average intelligence, but supervision is needed. The correlations with crop response if not already established in a region need to be determined. This part of the work has to be done by skilled technicians. In many areas considerable correlation has already been made. Where lacking, such correlations can readily be obtained if some money and effort are put to the job.

We are on the threshold of a great era of scientifically applied agriculture. Proper use of rapid soil tests can supply necessary information for the intelligent use of lime, fertilizers, and other amendments, thereby increasing the efficiency of every farmer and so his prosperity. The extent to which we put rapid soil tests to work will in a large measure determine whether we will obtain full value of lime and fertilizers used and the maximum yield and quality crop possible. Until farmers can take into consideration the soil needs for producing a maximum crop of high quality, they must work in the dark, guessing at the amounts needed, wasting ingredients added, and reducing their returns.

From Broom Sedge to Beef Cattle

(*From page* 12)

He feeds his crops to a herd of beef cattle he raises and to a flock of 700 Leghorn pullets. He has found it not only a good paying combination but a source of steady income. In recent years, he has been selling some of his hay and grain, "to get it out of the way of this year's crop." He is no

Fig. 3. These fat, healthy beef cattle on the Paul Schaus farm are thriving on a field of ladino clover growing on the once nearly worthless hillside. Broom sedge has been replaced by the pasture crop through proper fertilization and erosion control.

speculator. He has no desire to go into farming in a big way. For example, he could pasture over 100 feeder cattle this year on his grassland instead of his herd of 40, but he would rather be sure there will be more than enough pasture and feed. Likewise, Schaus could buy much more land to add to his 160-acre farm, but he assures you he would rather be a good farmer than a big operator.

"Besides," Schaus explains, "with my farm set-up, I have time to do some of the things my neighbors ask me to do." A check-up shows they ask him plenty. He is township farm bureau chairman, AAA chairman, chairman of the Spencer county co-op, and chairman of board of trustees at St. Peter's church at Lamar. In addition he is trouble shooter for the Lamar telephone cooperative. He volunteers that service just to make sure the community enterprise will always function.

Potash Fertilization of Alfalfa in Connecticut

(*From page* 15)

Mg analyses are not available for the first two cuttings, so table 4 shows the total milliequivalents of Ca, K, and Mg for the last four cuttings only.

A study of these figures shows that the totals of the three elements varied very little regardless of when the K was applied. This conclusion agrees with the studies published by New Jersey and Indiana showing that the cation content of alfalfa tended to be constant. The alfalfa samples were not analyzed for Na in the Storrs experiment. However, analyses made by the New Jersey Station indicated that the Na content of alfalfa was usually less than one milliequivalent per 100 grams of dry matter.

In the spring of 1945, soil samples were taken by one-inch layers to a depth of six inches from various plots in the field used for this experiment. These samples have been analyzed for available potash by the method of Volk and Truog. The results of some of these analyses are shown in table 5.

The amount of soluble potash in the top layers of soil from the plots receiving all the K application before seeding is higher than would be expected because an extra treatment of 200 pounds of 60 per cent KCl was applied in August 1944, at the end of the three-year experimental period. Under all treatments, the concentration of available potash decreased with increasing soil depth. Annual applications of 200 pounds of 60 per cent KCl have maintained the most uniform concentration of soluble potash throughout the plow layer. Frequent small applications of

TABLE 5.—READILY AVAILABLE SOIL POTASH AS EFFECTED BY POTASH FERTILIZATION

K treatment		Soluble potash by inch layers (Pounds per acre)					
		0–1″	1–2″	2–3″	3–4″	4–5″	5–6″
600 lbs.	60% KCl before seeding	436	294	167	94	72	70
200 lbs.	Annually	397	252	153	109	98	108
67 lbs.	Every April, June, August	633	343	190	87	67	70
10 tons	Manure every August	421	230	131	96	93	83

potash have maintained a relatively high level of soluble potash in the first and second inches compared with the lower layers. By way of comparison, Volk and Truog have set 200 pounds per acre of available potash in the plow layer as the minimum amount required for most crops.

The results of this experiment as well as data from other stations tend to show that "luxury consumption" of alfalfa occurs when the supply of available potash in the soil is plentiful. This results in a change in the balance of minerals absorbed by the plant. To maintain stands and yields of pure alfalfa, it seems advisable to apply potash in more frequent and smaller amounts. On the basis of our present knowledge, an application of 200 pounds of 60 per cent KCl annually would be recommended for alfalfa.

Urine Spots Reveal Soil's Deficiencies

(*From page* 23)

the urine spots is indicative of a desirable rate.

The present general practice of applying 200 to 300 pounds of a complete fertilizer in connection with the seeding of a grain crop in which a new meadow is being established and expecting this to meet the requirements of the next two or three years certainly does not seem adequate. Whether or not extra fertilizer can be profitably used, what its composition should be, and where, how, and when it should be applied are questions needing further study. Plants, like farm animals, cannot grow without adequate nutrients. Our pasture and hay crops, because of their feed value and effect on soil productivity, are probably our most valuable general farm crops, but for them we make the poorest provision of the nutrients they require.

Fertilizer Placement . . . on Sandy Soils of Minnesota

(*From page* 19)

meter of more sandy areas. The field also had been well managed and had been in alfalfa for two years preceding the 1946 corn crop. The July-August rainfall totaled 5.10 inches with the normal average for this period being 6.63 inches. Lack of moisture and available plant foods did not limit plant growth on this soil as severely as on the three other fields. The application of fertilizer in the hill was carried out one week after planting, being applied as soon as the plants emerged. This irregularity from the usual procedure of fertilizing at planting time was caused by the operator being unable to mark rows without planting. Table 4 presents the yields obtained.

It is evident that the deep placement of fertilizer may have been superior to the hill-dropping method on this field. It is impossible to establish whether this yield difference was brought about by the fertilizer placement or was due to the delay in applying the hill-dropped fertilizer.

The investigators considered the possibility of fertilizer placement affecting the concentrations of nitrate, phosphate, and potash in the growing tissues of the corn plants. Extensive field tests of the growing tissue at three periods in the later stages of development showed that fertilizer placement had little or no significant effect on the concentrations of these nutrients.

TABLE 5.—SUMMARY OF THE EFFECT OF FERTILIZER PLACEMENT ON INCREASING CORN YIELDS GROWN ON FOUR SANDY MINNESOTA FIELDS. 1946.

County	Soil type	Soil texture	Total rainfall July–August		Average yield of six fertilizer treatments with four replicates			
					Ear corn, bu./A		Fodder, tons/A	
			Inches	% of Normal	Hill-dropped	Plowed-under	Hill-dropped	Plowed-under
Anoka	Hubbard	Loamy fine sand	1.37	21	2.6	8.3	0.73	0.74
Sherburne	Zimmerman	Loamy fine sand	1.73	25	25.0	23.6	0.96	1.01
Isanti	Zimmerman	Loamy fine sand	3.03	46	38.5	31.2	1.50	1.33
Chisago	Berrien	Loamy fine sand	5.10	77	42.2	49.9	1.50	1.55
Grand Average (96 plots)					27.1	28.2	1.17	1.16

A summary of fertilizer placement effects on the yield of corn under variable moisture conditions is given in table 5.

The use of the "plow-under" method for the deep placement of commercial fertilizer is theoretically ideal, especially in growing seasons experiencing a rainfall deficiency or a poor precipitation distribution. The study of fertilizer placement on the sandy soils of Minnesota during the growing season of 1946 was an excellent opportunity to study the effect of deep-fertilizer placement on soils of relatively low fertility and low water-holding capacity. It is obvious that the effect of fertilizer placement will vary, depending upon soil and weather conditions. It is also apparent that deep placement of commercial fertilizer is not invariably superior to the hill-dropping method commonly practiced by the farmers of this State.

Soil Fertility . . . Cotton Profits

(*From page* 26)

or state. No attempt is made to discount the value of management or to show that the picture portrayed by these farms of low fertility could not be changed under different management. This is a separate factor of production and will be considered later.

Soil Management Is Important

In order to show the effect of excellent management on the profit obtained from an acre of cotton, some attention was given to three farms on which the operators were practicing excellent systems of management. Data collected on these farms for the same year are shown in Table 4, along with a comparison with the average gross returns, cost per acre, and profit per acre for 32 farms used in the study. The operators of these farms were doing an excellent job of management and the crops were all arranged and planned according to soil conditions. Large amounts of commercial fertilizers were used on all three farms and proved to be good investments. The cost figures involved in producing an acre of cotton on these farms were all high. However, the high yields obtained under this type of management were sufficient to pay high production costs and still leave a good margin of profit. These farmers had done an

excellent job of farm planning and the different soils were planted to crops well adapted to them. The ideal of "treating every acre according to its needs" was approached on these farms.

The soils comprising these three farms were all sandy Coastal Plain soils and were normally low to medium in fertility levels. Soils like Ruston, Savannah, Cahaba, Prentiss, Iuka, and Manatchie sandy loams made up the greater part of all three farms. There were also some areas of poorly drained soils such as Myatt and Bibb on these farms. In every case, these poorly drained soils were being utilized for pastures, and corn and feed crops were grown on the bottom soils, and the cotton was grown on the upland or better drained terrace soils.

The operators of these farms had planted the crops according to soil conditions, which is the paramount factor in good farm management. By adjusting the crops to the soils, fertilization paid high dividends. It can be seen from Table 4 that the average cost to produce an acre of cotton on these three farms was approximately $100. However, this money proved to be a good investment in terms of high yields per acre and total income. By spending $129 per acre, one of these farmers made $213, or a profit of $83 from each acre planted to cotton that year. This is more profit than was realized by the farmers on the fertile land, but if the farmers on the fertile land had been practicing crop adaptation and fertilization equivalent to these three operators, their total farm incomes and profits would surely have been much greater. When the crops are planted according to desirable soil conditions, fertilizer responses are at a maximum, and the profits are, of course, greater.

An effort had been made on these farms to utilize to a good advantage all the land on the farm as well as the portion planted to cotton. There are many farms on which the operators are doing an excellent job of management on a portion of the land, but at the same time are neglecting sadly a greater part of the farm. In some cases 80 out of 100 acres will be producing very little and receiving no attention from the owner or operator. The taxes paid by the farmers on their land are usually the same on every acre regardless of the use made of it. Therefore every acre of land on the farm should be devoted to some profitable crop. In some cases the best adapted crop may be cotton; in others, pastures; in others, timber; and in others, fish. No land, where there is sufficient moisture, is worthless. Land is only worthless in terms of some uses. Whenever proper land use is practiced, every acre pays its pro rata share of the farm income and no part of the farm is a burden or liability to another part.

As stated before, farming is a business involving two principal factors: the man or operator, and the land or physical resources. Excellent management

TABLE 3. COTTON PRODUCTION DATA ON SIX FARMS WITH LOW FERTILITY LEVELS

	500# bales per acre	Returns per acre	Cost per acre	Profit per acre	Labor returns per hour
	.48	63.00	57.00	6.00	.590
	.70	87.00	68.00	19.00	.470
	.67	85.00	69.00	16.00	.640
	.80	102.00	83.00	19.00	.590
	.60	74.00	65.00	9.00	.470
	.40	52.00	48.00	4.00	.330
Average.....	.60	77.00	65.00	12.00	.515

TABLE 4. THE EFFECT OF GOOD MANAGEMENT ON COTTON PRODUCTION

	500# bales per acre	Gross returns per acre	Cost per acre	Profit per acre	Labor returns per hour
	1.51	181.00	99.00	82.00	.940
	1.70	213.00	129.00	83.00	.920
	1.10	135.00	69.00	66.00	.940
Average	1.43	176.00	99.00	77.00	.933
Average of 32 farms in study	.....	121.58	82.68	38.90	.....

will always get more efficiency out of the land than poor management, but the possibilities of the operator are limited by the productive capacity of the soil. The data obtained from this study also indicate that soils having low fertility levels might better be used for the production of some crop other than cotton. Some other type of farming would probably be more suitable and provide employment over a greater part of the year. With a profit of only $12.00 per acre, it would require more acres of cotton than the average farm family could manage to enjoy a comfortable living. More acreage is usually necessary in order to change from a cotton economy to another system of farming. This brings forth a land problem that is often difficult to solve, but in areas where the fertility level of the soils is low, it may be easier to solve this problem than to try to make a decent living by clinging to the tradition of growing cotton continuously.

About Pa

(*From page* 5)

other Twin. It seems that he was dubbed a "clown," meaning one who could play practical jokes and perform odd and humorous things. And as for the man of muscle, he often related how the storekeeper in his adopted village was the terror of rascals and rowdies, because he was able to haul off like lightning and strike a "hundred-pound blow." Possibly Abe Lincoln was not the only efficient merchant in the Midwest of that era. (If Dad's folks had used motor cars instead of oxen, they might have gone visiting in the Illinois Sangamon country inside of four or five hours.)

The sand country where they settled furnished little or no incentive or chance for good farming, even as meager as the skills were then. This is the reason no doubt that my Father was never a first-rate farmer, but one who liked to live in the open and grow a few necessary crops, just enough for his family and the livestock with naught to sell toward a bank account. It was not indolence or carelessness which plagued those unlucky squatters whose choice of claims was based on timber and wells. Funds to better their lot or find a nicer location were not forthcoming in the tight times of the Fifties in that far-off land of barter and trade.

Except for the Civil War adventure and the subsequent elevation of my Father to be post commander or adjutant or officer of the day or some-

thing, his life was pretty ordinary. He worked at what his hands could turn up, having no trade or skilled craftsmanship. No thankful government bestowed sustenance or scholarships upon him with which to make up for lost time. In fact by dint of lots of maneuvering and much oath-taking and physical examinations, as well as fees to special Washington pleaders, he like many other veterans of the time finally received as much as twelve dollars a month pension. And plenty of citizens hated to see him cash that voucher four times a year and begrudged it to him. But of course $144 annually was some money in the Nineties when you never ate out, saw a movie, or bet on the ponies. It worked all right when your kids were trained never to ask for money and to be tickled pink over a foaming glass of root beer as a Saturday treat. All the same, it meant that you didn't have much left in your marble bag when all the other fellows were playing for "keeps."

AFTER discharge from the Army there seemed little to do on the one-horse farm up in the hills, so Father went into the next best opportunity—the lumber woods. This was in the heyday of the big cuts, the huge river-borne rafts, the cook shack, and the long drives. I guess Dad put in good licks at all of it, as well as hauling supplies. He made several excursions with rafts down the Mississippi, past towns he knew as a soldier. He must have worked for Mike Fink and Paul Bunyan, although I never heard any of those legends from Father, strange to say. But he cooked and ate so many flapjacks and baked beans during his logging days that we seldom had those tidbits on our table while I was growing up.

Somehow he got hold of a picture taken at a shingle mill where he was employed, the only graphic evidence of his years of toil. Its yellow hazy surface shows a long shed-like building with a tall smoke stack, and a crew of a dozen men perched on the roof. Dad said he was the fourth man from the west edge, but one must take his word for it.

WE of humble, unpretentious parentage retain much of certain family incidents to refresh us whenever the murk of material hazards threatens our peace of mind. Each of us has these obscure, unsung examples of fortitude which discount all the fumblings and failures.

Among these simple things I treasure most, to be explicit, is the strange relationship I bear in spirit to a white pine tree. This tall, majestic pine stands watch over a quiet country graveyard in a southern Minnesota county. For nearly sixty-five years this tree has seen the drought and the deluge, the clouds and the sunshine, the hopes and the fears of rural folk whose loved ones come to rest beneath its resinous boughs. Its relationship to me lies in the saga of its seedling, planted by my Father in that spring which followed a wintertime of woe.

He had come to Minnesota with his frail wife and three small children, hiring out as a tenant laborer after futile years trying to "catch up" after the Civil War and lumber camp experiences. The proverbial church mouse was a cheese-surfeited fatty compared with him. Like Mark Tapley, however, he usually found occasion to be "jolly" when other folks would normally be glum; and he made the most of meager comforts amid his round of rough and rigorous toil.

His optimism met a test indeed that winter of the Seventies. His summer's wages hardly sufficed to buy the family's food, albeit the fuel could be hewn from slashings round about. In January his wife's dry cough grew worse, and the fatal ending hung like a specter at her bedside. An epidemic of diphtheria seized the pioneer community, and Father nursed the two elder children to safety, after one consultation with an overworked practitioner.

Alone amid the greasy utensils in a

man's culinary sphere, milking one cow and keeping the homestead fires alive, he was hardly prepared to welcome the Angel of Death in proper fashion—yet she came and bore away the youngest child, a boy of four, who had been defeated by thin living and the current malady.

THUS I am confident that as each one of us passes the half century an old stiff rocking-chair, with one of his wife's faded patchwork quilts wrapped in folds over himself and the choking baby. I remember his repeating the incident to me in after years, after his second marriage in our own home. He told me how strong he felt in faith and hope because tiny "Elmo" reached up his hands and touched the tips of unseen wings in that cold and cheerless room.

Nobody came to the funeral. You see, it was pretty cold weather in Minnesota that year, and the rough, new roads were not plowed out as quickly as they are today after every storm. Besides, Father never had much time or money for churchly contributions in the local parish. He was just a drifting stranger doing day-work anyhow. Few there were who even knew him on the streets.

So Father found a little pine packing case somewhere, and he took his pick and shovel over to the adjacent cemetery and carefully located a spot in the no man's land of the Potter's Field, where he laboriously dug the little grave. I guess for this once anyhow he didn't feel very jolly, but he remembered a few verses from the New Testament and so after he had lowered the small box into the narrow frosted hole, he bent down a minute in the deep snow for a private doxology. After he had thrown back the frozen clods and marked the spot with a shingle, Father resolved to erect a more suitable living memorial to his boy in the coming springtime.

And again in the spring when he found time to transplant the seedling pine, his labors were also unattended and unobserved save for stray squirrels and songbirds. His wife had meanwhile passed away and her body had been taken to another burial ground by her relatives.

On that May morning Father probably had more time and inclination for a private ceremony and some reverent reveries all his own, at least more than he had when my half-brother was buried. At any rate, he set the tree a few feet beyond the unmarked mound and kept it well watered from that spring through the summer, hoping against hope that when he moved away in the fall the roots of the seedling pine would sustain it as a lasting landmark, so that the stubborn land so unkind to little ones of low degree might grow a giant pine to outlive generations yet to come and be a mark of one man's courage amid much harrowing care.

It really did. And this is why I am a little proud of being somewhat related to a calm and glorious pine—as much a part of my family life and tradition as any blood relation whom I claim and love. It reaches a step nearer immortality than any of us hope to come, for that tree is known quite well throughout that happy countryside and is therefore safe from vandals because of its pride and beauty of form and its sanctified location.

THUS I am confident that as each one of us passes the half century mark and knows that the first half is always the hardest, it will not be so difficult to be serene and patient toward that which remains to be done. We have been heirs to many errors, but likewise we are the reapers of a golden harvest of memory in which the noble and the just and humble predominate. Whether or not that which is left for us to do has a "punch" in it, we may be sure that we shall get some "kick" out of it after all.

I guess there are just about two classes of folks when it comes to family

memories and histories. One group is always delving into annals and pedigrees, not being quite satisfied in having an immediate humble origin but always hoping that somewhere in the tomes of past years they will stumble upon something genteel and polished. The other tribe is like me—fairly satisfied that I did not inherit a harelip or color-blindness, or have moronic tendencies from too many inbred strains. Actually, I can't tell you what year my great-grandfather immigrated to America or how many Injuns he killed. I lack a single picture of any ancestor back of my own Father and wouldn't recognize one if somebody dragged it out of an album somewhere up in New England. Thus plenty of glory has perished, and maybe a heap of shenanigans too. I may have deprived my progeny of a lot of distinction, but they can start in fresh and make some for themselves.

FOR after all is said and done, we have to remember that we are or have been Fathers and Mothers also. Some of this next generation some day will find a little time on their hands between office hours and conventions to think back to simpler years when you and I ran the family show. They won't bother any too much about musty archives or what Grandfather did before they were born, but they will retain a fairly clear mental picture of the ups and downs of Life with Father.

If our health stays good, it's up to us to show them that we are not entirely forgetful or forgotten, and that we can still laugh at life a little, exert some interest outside of our own bellyaches, and behave with decorum and tolerance in an age which has somehow grown wider and deeper than the one wherein we took root.

No, a lot of us aren't going to find a spot in history books or monuments to perpetuate us, but our only hope is to live so as to achieve fair treatment a few years hence when the kids have time to "think about Pa."

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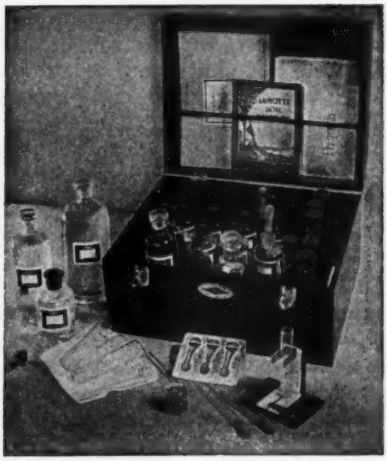

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THE AMERICAN POTASH INSTITUTE
1155 16TH STREET, N. W. WASHINGTON 6, D. C.

The wind was blowing very violently on a street corner and a young lady's dress was blown up around her neck. When a man standing near began to laugh, she irately said, "I see you are no gentleman."

"No, and I see you are not either," was the reply.

An insurance man met a friend and said, "Your wife needs an insurance policy to protect her fur coats and clothes."

"No," said the friend, "She has a new idea. I found out about it last night when I got home. She has a man in the closet watching them."

A woman in slacks: So round, so firm, so fully packed!

All men are born free and equal, but most of them get married.

Little Willie had just returned from his first day at Sunday School where his teacher had been a middle-aged woman.

Mother: "How did you like Sunday School, Willie?"

Willie: "Oh, it was all right."

Mother: "What didn't you like about it, dear?"

Willie: "Well, the teacher talked all the time about Jesus. How wonderful he was and how good. I guess she's his grandmother."

It was a warm day, and a dull case concerning the rights of river commissioners was being argued.

Counsel made speeches of interminable length, and the judge fell into a doze.

"But, we must have water here, your honor," thundered the defending lawyer in such stentorian tones that the judge came to.

"All right," he mumbled hastily, "but only a very little in mine!"

When Junior asked his parents about life they told him they had planted a seed and he grew from it. That night Junior put a watermelon seed under the rug. The next morning he lifted up the rug and there was a big cockroach.

Junior addressed the cockroach sternly: "You're very lucky. If you weren't my son, I'd squash you."

One arm makes dangerous driving and darn poor hugging.

"What about this 'ere universal disarmament, Bill?"

"Why, it's summat like me and my old woman. When there's a bit of a shindy brewin' the one wot proposes peace is the one wot ain't got 'old of the poker!"

Then there's the one about the guy who shipped a pair of rabbits from coast to coast by air express. The crate arrived with two rabbits. That's fast transportation!

Need for—

BORON IN AGRICULTURE

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops.

Outstanding results have been obtained with the application of Borax in specific quantities or as part of the regular fertilizer mix, improving the quality and increasing the production of alfalfa and other legumes, table beets, sugar beets, apples, etc.

The work of the State Agricultural Stations and recommendations of the County Agents are steadily increasing the recognition of the need for Boron in agriculture. We are prepared to render every practical assistance.

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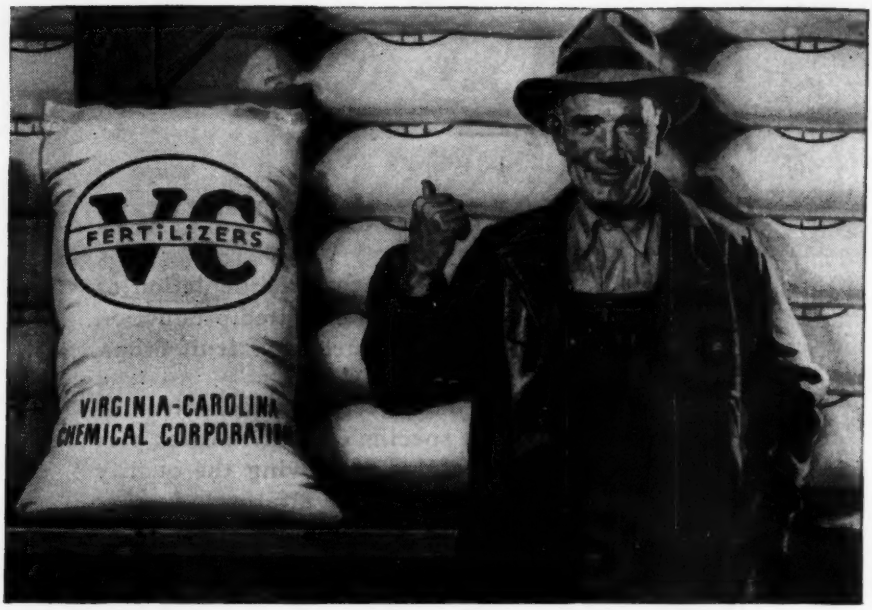

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The crop-producing power of V-C Fertilizers is the result of over 50 years of V-C scientific research, V-C practical farm experience and V-C manufacturing skill.

Since 1895, V-C factory experts, chemists and agronomists have constantly tested and developed new methods and new materials, to produce better and better V-C Fertilizers for every crop on every soil.

When you buy V-C Fertilizers, you buy bigger yields for your land, labor and machinery, at extremely low cost for the extra crops produced. By helping each acre of your farm yield as much as several poorly-fertilized scrub acres would yield, V-C Fertilizers save work, worry and expense.

This means more leisure time for you and your family... and more money for you to make your farm a more attractive place to live.

Virginia-Carolina Chemical Corporation manufactures V-C Fertilizers balanced to meet the particular plantfood needs of every crop you grow.

But what you really get, when you buy V-C Fertilizers, is more than just a mixture of fertilizer materials in a bag. What you are really buying is the more abundant harvest that makes farming a better-paying business.

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DOWNY MILDEW OF CABBAGE—Use Spergon (Wettable) as a spray or dust. It is widely recommended by leading authorities.

LEAF BLIGHTS AND ANTHRACNOSE OF TOMATOES—Use Phygon (Wettable) as a dust or spray. It gives economical control and increased yields.

SEED DECAY AND DAMPING-OFF OF BEETS, SPINACH, TOMATOES, PEPPERS AND SWISS CHARD—Use Phygon seed protectant. It is outstanding for these crops.

ANTHRACNOSE OF BEANS CAN BE CONTROLLED—Use Phygon as a seed protectant, followed by Phygon (Wettable) as a spray ten days after emergence. Don't lose your bean crop this year now that an effective control is available.

CORN BORER AND THRIPS—Use Syndeet-S-30. This is an oil solution containing 30% DDT for making emulsion type sprays. It has given effective economical control in field applications.

APHIDS, EUROPEAN RED MITES AND CODLING MOTH—Use Syndeet-30. At economical dosages, it gives commercial control of these orchard pests.

APHIDS, COLORADO POTATO BEETLES, LEAF HOPPERS AND FLEA BEETLES ON POTATOES—Use Syndeet-30. It gives control with a labor-saving reduction in the number of sprays required. Syndeet-30 is compatible with Bordeaux mixture.

WEED CONTROL—Use Tufor-40, Tufor-70 and Tufor-E. These formulations of 2, 4-D meet selective weed control problems.

EDIBLE VEGETABLE INSECT CONTROL—Use Syntone—a fortified rotenone emulsion.

These recommendations are made on the basis of authoritative field trials by leading plant pathologists and entomologists.

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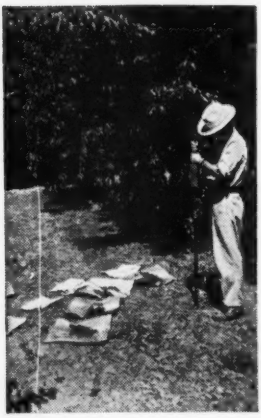
THE PLANT SPEAKS

A new four-reel series of 16 mm., sound, color films which may be booked independently or in any combination. They may be used to best advantage when shown at least one day apart and in the following sequence:



THE PLANT SPEAKS THRU DEFICIENCY SYMPTOMS pictures soil depletion, erosion, and deficiency symptoms on plants. (Running time 25 min. on 800-ft. reel.)

THE PLANT SPEAKS, SOIL TESTS TELL US WHY depicts taking soil samples on the farm and the interpretation of soil tests. (Running time 10 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU TISSUE TESTS shows the value of tissue testing and the procedure for testing plant tissues in the field. (Running time 14 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU LEAF ANALYSIS evaluates leaves in plant growth and leaf analysis in determining fertilizer needs. (Running time 18 min. on 800-ft. reel.)

We shall be pleased to loan these films to agricultural colleges, experiment stations, county agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade.

OTHER 16MM. COLOR FILMS AVAILABLE FOR TERRITORIES INDICATED

Potash in Southern Agriculture (South)
In the Clover (Northeast)
Bringing Citrus Quality to Market (West)
Machine Placement of Fertilizer (West)
Ladino Clover Pastures (West)
Potash from Soil to Plant (West)
Potash Deficiency in Grapes and Prunes (West)
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Potash Production in America (All)
Save That Soil (All)
Borax From Desert to Farm (All)

IMPORTANT

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of time of loan.

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